TESTING THE RELATIVE CONTRIBUTIONS OF AUTOBIOGRAPHICAL OVERGENERALITY AND INSTRUCTION NEGLECT TO SCORES ON THE AUTOBIOGRAPHICAL MEMORY TEST

by

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ABSTRACT

It has been reported that persons suffering from depression tend to have difficulty retrieving autobiographical memories of events that occurred on a single day in their lives (e.g., "*Last Tuesday night in the Student Union*"), and tend instead to retrieve memories that encompass a category of events over extended time periods (e.g., "*I used to go to the Student Union a lot.*"). However, the instrument with which this phenomenon is generally measured – the Autobiographical Memory Test (AMT) – appears to confound the effects of at least two separate underlying processes: (1) the inability or unwillingness of depressed persons to remember and comply with the AMT's instruction to retrieve only single-day memories (instruction neglect), and (2) the tendency of depressed persons to have a preponderance of (or easier access to) autobiographical memories that conflate extended time periods and/or categories of events, and to have fewer (or more difficult access to) autobiographical memories of single-day events (autobiographical overgenerality). There are reasons to suppose that both of these processes may be associated with depression and that they both contribute to, and are confounded in, scores on the AMT. This dissertation project employed two different versions of the AMT in an attempt to dissociate these two processes. However, the scores on neither of these tests correlated with measures of depression, depressive rumination, or executive dysfunction. Given the power of this study, these null results are partially interpretable, and a plausible explanation there for is that scores on the standard version

of the AMT are driven largely by instruction neglect, but the design of this study inadvertently prevented the detection of that process.

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CHAPTER I

INTRODUCTION

Literature review

Origin of the AMT

In 1986, while pilot testing a study of mood-congruent recall among recent suicide attempters, Williams and Broadbent made a serendipitous observation that recently suicidal respondents had difficulty retrieving memories of events that occurred on a single day in their lives: When instructed to retrieve such temporally specific memories, they often violated the instruction and instead retrieved memories encompassing time periods longer than a single day (e.g., "*when I was at school*") or memories that refer not to single-day events, but to geographical locations (e.g., "*that hotel in Germany*"; Williams & Broadbent, 1986). To further study this phenomenon, Williams and Broadbent developed the Autobiographical Memory Test (AMT) in which respondents are presented with a series of cue word stimuli (e.g., *happy, angry*) and instructed that following each cue word they should retrieve a specific autobiographical memory of which the cue word reminds them. Participants are further instructed that a "specific" autobiographical memory is a memory of a personally experienced event that occurred on a single day in their lives.

Williams and Broadbent administered the AMT to a group of 25 participants who were hospitalized following a suicide attempt, a control group of 25 nonsuicidal

participants who were hospitalized for medical concerns, and a second control group of 25 nonsuicidal and nonhospitalized participants. The authors then coded each of the memories retrieved by their participants as either specific (i.e., in compliance with the specificity instruction) or overgeneral (i.e., contrary to the specificity instruction). For example, in response to the cue word *happy*, an autobiographical memory such as "*at home last Tuesday evening*" was coded as specific, while a memory such as "*when I am at home*" was coded as overgeneral (Williams & Scott, 1988). Williams and Broadbent report that 44% of the memories retrieved by the recently suicidal participants were overgeneral, while only 20% of the memories retrieved by the hospitalized control participants and 19% of the memories retrieved by the nonhospitalized control participants were overgeneral. Thus, the recently suicidal participants were significantly more likely than the participants in either control group to violate the specificity instruction and to retrieve overgeneral memories in response to the AMT's cue words (Williams & Broadbent, 1986).

Associations between AMT scores and depression

Williams and Broadbent's 1986 report has generated a significant amount of research activity. In 2006, the journal *Cognition and Emotion* published a Special Issue on the associations between psychopathology and the tendency to retrieve overgeneral memories in response to the AMT. In the introduction to that Special Issue, Hermans, Raes, Philippot, and Kremers (2006) noted that in the preceding 20 years there had been over 150 publications on this topic. The Special Issue itself contained an additional 12 such articles. A computerized literature search conducted on January 22, 2011, in which the phrase "*autobiographical memory test*" was entered into the "Tests & Measurements"

field of the PsycINFO article database, yielded an additional 66 publications in the years 2007 through 2010.

This body of published research that has accumulated in the 24 years since the publication of Williams and Broadbent's 1986 report can be roughly divided into three categories:

- Cross-sectional studies of the association between depression and a pattern of overgeneral responses to the AMT;
- Studies of the persistence of a pattern of overgeneral responses to the AMT after the remission of depression; and
- Studies of a pattern of overgeneral responses to the AMT as a predictor of the onset and course of depression.

Studies exemplifying each of these categories are summarized below.

Cross-sectional studies

Williams and Broadbent's (1986) finding that recently suicidal participants retrieve fewer specific autobiographical memories in response to the AMT than do nonsuicidal control participants has been replicated in studies by Kaviani, Rahimi-Darabad, and Naghavi (2005), Leibetseder, Rohrer, Mackinger, and Fartacek (2006), Pollock and Williams (1998), and Williams, Ellis, Tyers and Healy (1996). However, the majority of research in this area has addressed whether this effect generalizes beyond recent suicidality. It has been reported that overgenerality of AMT responses is reliably associated with clinical depression (van Vreeswijk & de Wilde, 2004; Williams et al., 2007). The association between nonclinical depression and overgeneral AMT responses is less consistent: Some studies have found such an association (Goddard, Dritschel, &

Burton, 1997; Raes, Hermans, Williams, & Eelen, 2007; Ramponi, Barnard, & Nimmo-Smith, 2004; Rekart, Mineka, & Zinbarg, 2006), while others have not (e.g., Raes, Pousset, & Hermans, 2004).[1]

Persistence studies

If the published findings regarding associations with overgeneral AMT responses were limited to the sorts of cross-sectional, correlational studies discussed in the preceding section, then these associations might be interpreted not as reflecting a phenomenon separate from depression, but simply as manifesting a previously undetected symptom of depression. However, the overgenerality of autobiographical memories retrieved in response to the AMT not only correlates with current state depression, but has also been reported to persist as a relatively stable trait after the remittance of depressive symptomatology (Mackinger, Pachinger, Leibetseder, & Fartacek, 2000; Spinhoven et al., 2006; J. Mark Williams & Dritschel, 1988). This persistence of the overgenerality of AMT responses supports an inference that it is a phenomenon separate from, albeit associated with, depression.

Prediction studies

If the body of research regarding the associations of overgeneral AMT responses were limited to the cross-sectional, correlational studies and/or the longitudinal, persistence studies discussed in the preceding two sections, there would be no way to

[1]Depression is not the only form of psychopathology that has been reported to correlate with over-generality of AMT responses. For example, over-general AMT responses have been reported to correlate with a history of childhood abuse (Hermans et al., 2004), acute stress disorder (Harvey, Bryant, & Dang, 1998), and post-traumatic stress disorder (McNally, Lasko, Macklin, & Pitman, 1995). For the remainder of this paper, however, discussion will be limited to the association between AMT scores and depression.

resolve the question of causation: The findings of these studies are equally consistent with hypotheses that the AMT measures a cause of depression (e.g., that the tendency to respond to the AMT with overgeneral memories reflects some sort of vulnerability to depression), or that the AMT measures a consequence of depression (e.g., that the overgenerality of AMT responses is a persisting cognitive "scar" from past depression). However, additional longitudinal studies have addressed this question of causation, reporting that the tendency to give overgeneral autobiographical memories in response to the AMT precedes and predicts the onset and course of depression. Sumner, Griffith, and Mineka (2010) performed a meta-analysis of 15 of these studies and concluded that the overgenerality of responses to the AMT has a small but reliable predictive effect on the course of depression. Because of the importance of this question of causation in the present research project, several of the longitudinal studies that have reported this predictive effect are summarized below.

Raes et al. (2008) report that the tendency to retrieve overgeneral autobiographical memories in response to the AMT predicts a poor response to electroconvulsive therapy (ECT). Raes et al. administered the AMT and the Hamilton Rating Scale for Depression (HRSD) to 25 participants who had been diagnosed with major depressive disorder and who were about to undergo ECT. The HRSD was again administered immediately after the conclusion of each participant's course of ECT and again 1 week thereafter. The participants' pre-ECT AMT scores were not correlated with their HRSD scores immediately following ECT, but were correlated with the change in HRSD scores from immediately following ECT to 1 week thereafter ($r = 0.56$). This

correlation remained significant even after controlling for pre-ECT HRSD scores and post-ECT HRSD scores (Raes et al., 2008).

Kleim and Ehlers (2008) report that the tendency to retrieve overgeneral autobiographical memories in response to the AMT predicts the development of both PTSD and major depression following a physical assault. Kleim and Ehlers administered the AMT to 190 research participants 2 weeks after each had survived a physical assault. At the same time, the Acute Stress Disorder Scale was administered to assess symptoms of Acute Distress Disorder (ASD), and the Structured Clinical Interview for DSM-IV (SCID) was administered to assess symptoms of depression. Six months following the research participants' assaults, the SCID was again administered to assess for the presence of major depression and the PTSD Symptom Scale-Interview Version was administered to assess for the presence of PTSD. Although 43% of the variance in the incidence of PTSD at 6 months was explained by ASD symptom severity 2 weeks following the participants' assaults, an additional 4% of the variance was explained by AMT scores. And although 13% of the variance in the incidence of major depression at 6 months was explained by depressive symptom severity 2 weeks following the participants' assaults, an additional 6% of the variance was explained by AMT scores (Kleim & Ehlers, 2008).

Hermans et al. (2008) report that the overgenerality of AMT responses predicts the course of Major Depressive Disorder. Hermans et al. administered the AMT and the Beck Depression Inventory-II (BDI-II) to 26 research participants who had recently been admitted for in-patient treatment for Major Depressive Disorder. Three to four weeks later, these participants' diagnostic status was assessed with the SCID, and their level of

depressive symptomatology again assessed with the BDI-II. AMT scores were not correlated with BDI-II scores at admission, and did not predict BDI-II scores at follow-up.[2] However, AMT scores did predict which of the participants still met the diagnostic criteria for Major Depressive Disorder at follow-up (Hermans et al., 2008).

Gibbs and Rude (2004) report that the overgenerality of AMT responses interacts with life stress to predict subsequent depressive symptomatology. Gibbs and Rude administered the AMT and the BDI-II to 89 college students. Four to six weeks later, the BDI-II was again administered and the incidence of various types of life stressors in the period between baseline and follow-up was assessed with the Negative Life Events Questionnaire (NLEQ). Baseline BDI-II scores entered in the first step of a hierarchical multiple regression analysis accounted for 40% of the variance in follow-up BDI-II scores. The first-order effects of AMT scores and reported incidence of life stressors accounted for an additional 3% of the variance in follow-up BDI-II scores. But in addition, the interaction between AMT scores and life stressors accounted for another 4% of the variance in follow-up BDI-II scores (Gibbs & Rude, 2004).

It has also been reported that the tendency to retrieve overgeneral autobiographical memories in response to the AMT predicts the following:

- Remission of cognitive dimensions of DBI-II scores following initiation of continuous positive airway pressure therapy in persons who suffer from obstructive sleep apnea and who also have a history of major depression (Mackinger & Svaldi, 2004);

[2] A number of other articles have reported that the specificity of AMT specificity does predict the remission of depressive symptomatology (Brittlebank, Scott, Williams, & Ferrier, 1993; Peeters, Wessel, Merckelbach, & Boon-Vermeeren, 2002; Raes, Hermans, Williams, Beyers et al., 2006).

- Improvement in depressive symptomatology as measured by the Montgomery-Asberg Depression Rating Scale in male alcoholics following detoxification therapy (Mackinger et al., 2004);
- Course of Seasonal Affective Disorder (Dalgleish, Spinks, Yiend, & Kuyken, 2001);
- Vulnerability to postpartum depression (Hipwell, Reynolds, & Crick, 2004; Mackinger, Loschin, & Leibetseder, 2000); and
- Vulnerability to depression and anxiety following unsuccessful in vitro fertilization (van Minnen, Wessel, Verhaak, & Smeenk, 2005).

These reports that the overgenerality of AMT responses precedes and predicts the onset and/or course of depression support an inference that this phenomenon is somehow involved in the vulnerability to and maintenance of depression. However, notwithstanding 24 years of correlational and longitudinal research, it remains unclear what AMT scores actually signify, i.e., it is not clear what processes predispose respondents who are currently depressed, have previously been depressed, or are vulnerable to depression to retrieve overgeneral autobiographical memories in response to the AMT.

What does the AMT measure?

Throughout the AMT literature surveyed above, there is an almost universal presupposition that what the test measures is a characteristic of a respondent's autobiographical memory: the extent to which a respondent has a preponderance of (or easier access to) autobiographical memories that conflate extended time periods and/or categories of events, and paucity of (or more difficult access to) autobiographical

memories of single-day events. That is, a respondent's *public* behavior of reporting overgeneral autobiographical memories in response to the AMT is presupposed to reflect an overgeneral bias in his or her *intrapsychic* autobiographical memory processes.[3]

An example of this presupposition is the statement by Hermans et al. (2006) that the AMT literature demonstrates that "the inability to retrieve specific memories forms a chief characteristic of those who suffer from major depression" (p. 322). Likewise, Williams et al. (2007) state that the AMT measures a depressed person's tendency to "retrieve overgeneral memories when attempting to retrieve memories of specific events. . . . The phenomenon of overgeneral memory ranks alongside other memory deficits known for many years to be associated with depression" (p. 143). And Debeer, Hermans and Raes (2009) state that, "Research over the past 20 years has led to well-established evidence that depressed people show an overgeneral autobiographical memory bias" (p. 892). Throughout this dissertation report, the term "autobiographical overgenerality" will be used to refer to such an overgeneral bias in a person's intrapsychic autobiographical remembering. Within the existing AMT literature, any possibility that AMT scores might in whole or in part reflect something other than autobiographical overgenerality is rarely discussed or even acknowledged.[4]

However, in the majority of studies in this area, the AMT is the only measure used to assess autobiographical overgenerality (Sumner et al., 2010). Such reliance on a

[3] This distinction between the public behavior of responding to a test and an intrapsychic state or trait is common to many psychological tests. Thus, responding to the BDI-II in such a way that one's total score is relatively elevated is a public behavior. This behavior is not equivalent to the intrapsychic phenomenon of state or trait depression. The extent to which the public behavior reflects the intrapsychic state or trait is the focus of validation studies.

[4] As will be discussed below, Dalgleish et al. (2007) report findings that suggest that the AMT measures impairment of executive functioning. Although these findings implicitly challenge the presupposition that the AMT measures only autobiographical over-generality, Dalgleish et al. continue to phrase their findings in terms of autobiographical over-generality.

single instrument to measure a construct such as autobiographical overgenerality poses a risk of a validity error known as monomethod bias (Shadish, Cook, & Campbell, 2002). Although Williams and Broadbent (1986) developed the AMT with the intent that it measure autobiographical overgenerality, the scores on any single such instrument are inevitably an amalgam, reflecting not only the construct that is intended to be measured, but also the method by which the particular instrument takes the measurement (Campbell & Fiske, 1959). Because any single instrument confounds content and method, the valid measure of any construct requires more than one instrument (Campbell & Fiske, 1959). The threat to validity that results from the reliance on a single instrument is called monomethod bias (Shadish et al., 2002).

The format of the AMT creates one immediately apparent risk of monomethod bias. As stated above, the AMT instructs participants to retrieve a single-day autobiographical memory in response to each of a series of stimulus words. A participant's AMT score is his or her tendency to violate that specificity instruction, i.e., the proportion of the participant's responses that are not single-day autobiographical memories. Because of this format, there are two different intrapsychic processes by which a participant could achieve an AMT score reflecting a pattern of overgeneral responding: First, a participant may violate the specificity instruction for exactly the reason that is presupposed in the AMT literature -- autobiographical overgenerality. That is, a participant may give overgeneral autobiographical memories in response to the AMT (a public behavior) because she tends to remember her life in overgeneral terms and has a deficit of single-day memories, or at least difficulty accessing single-day memories (an intrapsychic characteristic of her autobiographical remembering). Try as she might, such

a participant would have difficulty complying with the instruction to retrieve only single-day memories, and would instead tend to respond with overgeneral memories. If this were the only process that could result in a pattern of overgeneral responses to the AMT, then the prevailing certitude about what the test measures would be justified.

There is, however, a second intrapsychic process that could result in the same public act of responding to the AMT with overgeneral memories. A participant could violate the AMT's specificity instruction if, while responding to the AMT, he has difficulty retaining the instruction in working memory as a result of limited executive capacity, or if he simply is unmotivated to comply with the instruction. Such a participant might report whatever autobiographical memories come first to mind, be they specific or overgeneral. Such haphazard responses would, on average, be more overgeneral than the responses of a participant who was able and motivated to diligently comply with the AMT's specificity instruction. This public behavior of giving relatively more overgeneral responses to the AMT would not, however, reflect any overgeneral bias in the respondent's intrapsychic memory, i.e., it would not measure autobiographical overgenerality. Rather, this overgenerality would reflect a very different intrapsychic process: the limitation of the respondent's capacity or motivation to comply with the AMT's specificity instruction. Throughout this dissertation report, the term "instruction neglect" will be used to refer to such inability to retain the AMT's specificity instruction in working memory or unwillingness to comply with the instruction.

Up to this point in the discussion, these two intrapsychic processes – (1) instruction neglect and (2) autobiographical overgenerality – have been presented as hypothetical processes that might cause depressed persons to violate the AMT's

specificity instruction and to respond to the test with memories that are on average more overgeneral than the responses of nondepressed persons. As discussed in the next two subsections, there are suggestions in the literature that both of these processes do in fact underlie and mediate the often-reported association between depression and the overgenerally of AMT responses, and that these two processes are therefore confounded in AMT scores.

Instruction neglect

As the construct of instruction neglect was defined above, it could reflect either lack of capacity or lack of motivation. Little research has been found regarding the second of these two etiologies – lack of motivation. It has been noted that persons suffering from depression tend to have impaired motivation to engage in cognitively demanding tasks, and that this motivational deficit may contribute to the impaired cognitive functioning that has been observed in depression (Burt, Zembar, & Niederehe, 1995; Hartlage, Alloy, Vázquez, & Dykman, 1993; Hertel & Rude, 1991). It is plausible that motivation deficits may contribute to the association between depression and a tendency to violate the AMT's specificity instruction, i.e., lacking the motivation to engage in the cognitive task of searching for single-day memories, depressed participants may simply report the first memory that comes to mind, whether or not it satisfies the specificity instruction. However, no studies have been found testing the impact of motivational status on AMT performance. The absence of studies on this point may reflect the practical difficulties of dissociating the impairment of motivation from the impairment of executive capacity (Hertel & Rude, 1991).

There are, however, several studies investigating the association between impairment of executive capacity and the tendency to make overgeneral AMT responses. In the principal investigator's master's thesis research, 52 participants were tested with a computerized version of the AMT together with a measure of executive functioning – a Visual Search Task that had been developed by Hammar, Lund, and Hugdahl (2003b). This Visual Search Task was also utilized in the present study, and will be described in detail below. Briefly stated, the Visual Search Task measures the extent to which visual scanning is slowed by visual distracters. Although participants with relatively intact executive control are able to maintain visual attention notwithstanding visual distraction, participants with impaired executive control are less able to do so and the introduction of visual distracters therefore results in a greater slowing of visual scanning speed. In the principal investigator's thesis research project AMT scores were found to correlate with Visual Search Task scores at $r = 0.37$, that is, participants whose visual attention was relatively susceptible to distraction also tended to be overgeneral in their AMT responses (McCowin, 2007).

Likewise, Ros, Latorre, and Serrano (2010) tested 96 participants with the AMT and various measures of "working memory executive processes." Specifically, the authors administered a measure of working memory with sustained attention in which participants were required to detect color sequences. Participants viewed a computer screen on which a series of colored asterisks were displayed one by one; participants were instructed to press the "1" key as quickly as possible when they saw one of the following three color sequences: red-black-blue, red-yellow-green, or pink-brown-purple. The authors reported that the number of specific responses to the AMT correlated

positively with the number of correct responses to the working memory with sustained attention task (r = 0.25), and correlated negatively with the latency of correct responses (r = -0.23), the number of incorrect responses (r = -0.25), and the latency of incorrect responses (r = -0.22). That is, participants who tended to be specific in their AMT responses also tended to correctly identify more of the target color sequences, to make fewer false-positive identification errors, and to respond more rapidly regardless of whether their responses were correct or false-positive.

Ros et al. (2010) also administered a reading span task which measured a participant's capacity to hold a series of letters in working memory while simultaneously judging the semantic correctness of a series of sentences. Participants viewed a computer screen on which a simple sentence was displayed; participants were instructed to read the sentence aloud and then indicate whether or not the sentence was semantically correct. A letter was then briefly displayed on the screen. Another simple sentence was displayed, then another letter, and so forth. Participants were shown sets of from two to five sentence/letter pairs. After each such set, participants were asked to recall the letters in the same order in which they had been presented. The authors reported that the number of specific responses to the AMT correlated positively with the number of correctly recalled letters (r = 0.31), and correlated negatively with the number of errors in judging the semantic correctness of sentences (r = -0.31). That is, participants who tended to be specific in their AMT responses also tended to correctly remember more of the letter sequences notwithstanding the concurrent cognitive load of judging the sentences' semantic correctness, and tended to make fewer errors in those judgments (Ros et al., 2010).

The association between executive impairment and overgenerality of AMT responses was further explored in a study by Heeren, Van Broeck, and Philippot (2009) testing whether mindfulness therapy has the effect of reducing the overgenerality of responses to the AMT, and whether this effect is mediated by an improvement in executive functioning. The authors recruited 36 participants, 18 of whom underwent 8 weeks of mindfulness training; the remaining 18 participants served as a control group. All 36 participants were tested with the AMT twice – a pretest before the 8-week mindfulness training, and a posttest at the end of the training. A mixed-design ANOVA for the number of categorical[5] responses to the AMT revealed a main effect of time (η^2 = 0.47) qualified by an interaction with group (η^2 = 0.19). The data are summarized in Table 1. That is, on the pretest the average AMT scores of the treatment group did not differ from the scores of the control group, and the AMT scores of the control group did not change from pretest to posttest. However, the AMT scores of the treatment group changed significantly from pretest to posttest, indicating that the mindfulness training had the effect of reducing their categorical responses to the AMT. As measures of cognitive

Table 1. Data reported by Heeren, Van Broeck, and Philippot (2009) showing effect of mindfulness training on AMT scores.

Categorical AMT Responses: Mean (standard deviation)		
	Pretest	Posttest
Mindfulness training group	2.33 (1.88)	0.22 (.54)
Control group	2.28 (1.88)	1.61 (0.98)

[5] Heeren, Van Broeck, and Philippot (2009) not only classified AMT responses as specific or over-general, but also subdivided the over-general AMT responses into "categoric" and "extended" classifications. Categorical memories refer to a category of repeated past events, while extended memories refer to past events that lasted longer than a single day. As discussed below, although mindfulness training reduced both categorical and extended AMT responses in the treatment group, improvement in cognitive functioning was found to mediate only the effect on categorical memories. Therefore, only the findings regarding categorical AMT responses are discussed in the text.

flexibility, the authors tested all 36 participants (both before and after the mindfulness training) with three measures of verbal flexibility – a semantic word fluency task, a phonemic word fluency task, and a verbs word fluency task. A mixed-design ANOVA for the semantic word fluency task showed a main effect of time (η^2=0.62), qualified by an interaction with group (η^2= 0.56). A mixed-design ANOVA for phonemic word fluency showed a main effect of time (η^2= 0.29), again qualified by an interaction with group (η^2=0.46). For the verbs word fluency task, a mixed-design ANOVA showed a main effect of time (η^2= 0.31), qualified by an interaction with Group (η^2=0.34). The data are summarized in Table 2. That is, on the pretest none of the verbal fluency scores of the treatment group differed from the scores of the control group, and the verbal fluency scores of the control group did not change from pretest to posttest. However, all three of the verbal fluency scores of the treatment group changed significantly from pretest to posttest, indicating that the mindfulness training had the effect of enhancing this facet of executive functioning. The authors then tested whether the sum of the three

Table 2. Data reported by Heeren, Van Broeck, and Philippot (2009) showing effect of mindfulness training on verbal fluency scores.

Verbal Fluency: Mean (standard deviation)			
		Pretest	Posttest
Mindfulness training group	Semantic	35.78 (9.54)	49.56 (12.56)
	Phonemic	25.39 (9.05)	34.56 (7.04)
	Verb	40.56 (12.48)	51.33 (12.01)
Control group	Semantic	32.56 (5.36)	33.39 (5.10)
	Phonemic	25.06 (4.62)	23.33 (4.02)
	verb	37.78 (8.33)	37.44 (7.66)

verbal fluency scores mediated the effect of mindfulness training upon AMT scores. The results of the mediation analysis are summarized in Figure 1. That is, mindfulness training had a significant effect both on participants' tendency to retrieve categorical memories in response to the AMT (Path C in Figure 1), and on the total of participants' three verbal fluency scores (Path A in Figure 1). In addition, the total verbal fluency scores had a significant effect on the tendency to give categorical AMT responses (Path B in Figure 1). When the total verbal fluency scores are controlled for, the effect of mindfulness upon the tendency to give categorical memories is significantly reduced (the change in the uncorrected β weight above Path C to the corrected β weight below Path C in Figure 1). The authors report that the Sobel test (1982) indicated that the mediation was statistically significant.

The three studies discussed above (Heeren et al., 2009; McCowin, 2007; Ros et al., 2010) support an inference that impairment of executive capacities might result in a pattern of overgeneral responding to the AMT, and that a treatment that has been shown to increase the specificity of AMT responses does so through the mediating mechanism of enhancing executive control. However, none of these studies was designed to test

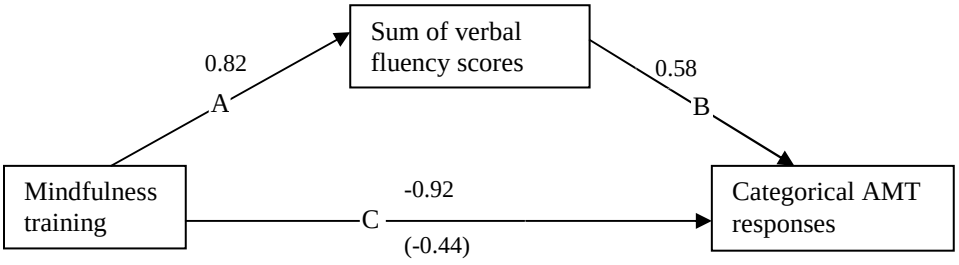

Figure 1. Mediation diagram reported by Heeren, Van Broeck, and Philippot (2009). Coefficients appearing above the path lines are uncorrected β weights. The coefficient in parentheses is corrected for mediation.

whether impairment of executive functioning might underlie and mediate the association between depression and the overgenerality of AMT responses. Dalgleish et al. (2007) report a series of eight studies that was designed to explore that issue.

In the first four of their eight studies, Dalgleish et al. (2007) found that overgenerality of AMT responses correlated positively with various measures of executive impairment, particularly when those measures reflected the participants' errors – their failure to comply with the tests' instructions. That is, when respondents' executive capacity was impaired, and particularly when that impairment resulted in their failure to comply with task instructions, the respondents also tended to violate the AMT's specificity instruction and report overgeneral autobiographical memories. In their sixth and seventh studies, in order to test the hypothesis that impairment of executive control partially mediates the correlation between depression and the tendency to retrieve overgeneral memories in response to the AMT, Dalgleish et al. manipulated the parameters of the AMT to vary the extent of the demand that the test places upon executive capacities. The authors predicted that depression and the demand on executive control would interact in their effect on AMT scores. That is, if the AMT parameters are manipulated so as to increase the demands on executive control, then the difference in AMT scores between depressed and nondepressed respondents should be increased. Alternatively, when the AMT parameters are manipulated so as to minimize the demands on executive control, then the difference in AMT scores between depressed and nondepressed respondents should be reduced.

In their sixth study, Dalgleish et al. manipulated the AMT's cue words. For half of the cues the authors selected words that routinely refer to short periods of time (e.g.,

kiss, *accident*, *evening*); the authors refer to cue words in this category as "short-duration" cue words. For the other half of the cue, the authors selected words that routinely refer to more extended periods of time (e.g., *summer*, *cancer*, *adolescence*); the authors refer to cue words in this category as "long-duration" cue words. Dalgleish et al. hypothesized that the long-duration cue words would tend to automatically evoke overgeneral autobiographical memories, and that inhibiting such automatically evoked overgeneral memories in order to persevere in the task of retrieving only specific autobiographical memories would place a demand on respondents' executive capacities. By contrast, it was hypothesized that the short-duration cue words would tend to automatically evoke specific memories, thereby facilitating respondents' compliance with the AMT's specificity instruction with minimal demands on executive control. Dalgleish administered this version of the AMT, together with the BDI, to a group of 18 participants and reported that although BDI scores were negatively correlated with the specificity of the respondents' responses to long-duration cue words (r = -0.50), there was almost no correlation between BDI scores and the specificity of responses to short-duration cue words (r = -0.06). Moreover, the authors calculated difference scores by subtracting the number of specific memories each participant retrieved in response to the long-duration cue words from the number of specific memories he or she retrieved in response to the short-duration cue words, and reported that these difference scores correlated with BDI scores (r = 0.55). That is, depression interacted with the load on executive capacity in their effect on AMT scores: The increase in the average overgenerality of responses to long-duration cue words as compared to the average overgenerality of responses to short-duration cue words was greater for participants

whose BDI scores indicated greater depressive symptomatology. Respondents with greater depressive symptomatology apparently had more difficulty than less depressed respondents in complying with the AMT's specificity instruction when this required them to inhibit overgeneral memories that were automatically evoked by the long-duration cue words (Dalgleish et al., 2007).

In their seventh study, Dalgleish et al. manipulated the extent of the demand on executive control by coupling the AMT with a concurrent cognitive load. The authors first administered the Digit Span subtest of the WAIS-III to 23 participants to determine each participant's forward digit span. Each participant was then tested with the BDI and with two versions of the AMT, a standard version of the test and version of the test that included a concurrent cognitive load. In the concurrent load version, prior to each cue word the participant was presented with a string of digits two digits shorter than his or her forward digit span; participants were instructed to remember the digits for recall after retrieval of an autobiographical memory. The cue word was then presented, the participant was allowed to retrieve and report an autobiographical memory, and the participant was then asked to repeat the digit string. This sequence was repeated for each of 16 digit string/cue word pairs. The authors calculated a difference score by subtracting the number of specific memories each participant retrieved in response to the concurrent load version of the AMT from the number of specific memories he or she had retrieved in response to the standard AMT, and reported that these difference scores correlated with BDI scores ($r = 0.42$). That is, depression again interacted with the load on executive capacity in their effect on the overgenerality of AMT responses: Participants whose BDI scores indicated a relatively low level of depressive symptomatology were relatively able

to comply with the AMT's specificity instruction whether or not they were simultaneously trying to remember a string of random digits. However, participants whose BDI scores indicated a relatively elevated level of depressive symptomatology had greater difficulty complying with the AMT's specificity instruction when they were simultaneously tasked with retaining a random digit string (Dalgleish et al., 2007).

Although the findings of the first seven studies published by Dalgleish et al. are consistent with an inference that instruction neglect resulting from executive impairment mediates the connection between depression and overgenerality of AMT responses, the strength of that inference is qualified by the confound discussed previously: In all versions of the AMT in which participants are instructed to retrieve only specific memories, instruction neglect will have the effect of yielding a relatively overgeneral response pattern, i.e., exactly the same effect that is yielded by autobiographical overgenerality. In their eighth study Dalgleish et al. modified the AMT's instructions in such a way that instruction neglect and autobiographical overgenerality are counterposed rather than confounded. Dalgleish et al. accomplished this by reversing the standard AMT's specificity instruction: In place of the test's usual instruction that participants should retrieve only single-day autobiographical memories, in their eighth study Dalgleish instructed respondents as follows:

> The memory you recall should be of a certain category of event; in other words, a series of similar events that happened to you at different times. So, if I said the word "good," it would not be okay to say "I had a good time at Jane's party," because that does not refer to a category of events. But it would be okay to say "I always enjoy the parties at my friend Jane's house" because that refers to a category of events. (Dalgleish et al., 2007, p. 36)

Thus, participants were instructed to retrieve overgeneral autobiographical memories in response to cue words; retrieval of a single-day memory would be an error. In this

reversed-instruction version of the AMT (rAMT) autobiographical overgenerality and instruction neglect have opposite effects on a respondent's tendency to give overgeneral responses. That is, if autobiographical overgenerality were the dominant process, then depressed participants should be better able to comply with the rAMT's overgenerality instruction: Their predominantly overgeneral autobiographical memories would make it easier to retrieve overgeneral memories. On the other hand, if executive impairment and consequent instruction neglect were the dominant processes, then depressed participants should be just as unable to comply with the rAMT's overgenerality instruction as they are unable to comply with the standard AMT's specificity instruction: They would respond to the rAMT haphazardly with whatever specific or overgeneral AM first came to mind, and such haphazard responding would, on average, be more specific than the responses of nondepressed participants who were able to utilize their unimpaired executive control to reliably comply with the rAMT's instruction to retrieve overgeneral memories.

Dalgleish et al. administered the rAMT, the BDI, and the Operational Span Task (OSPAN, a measure of controlled attention) to 32 participants (Dalgleish et al., 2007). BDI scores were positively correlated with the specificity (4^{th} root transformed) of memories retrieved in response to the rAMT (r = .35), that is, more depressed participants were more specific in their responses to the rAMT. Moreover, OSPAN scores correlated negatively with BDI scores (r = -.41), and also correlated negatively with the specificity of rAMT responses, even after controlling for BDI scores (pr = -.49), that is, more depressed participants were impaired in their ability to exercise controlled attention, and the more impaired the participants' controlled attention, the more likely

they were to violate the rAMT's overgenerality instruction and to retrieve specific autobiographical memories.

These results reported by Dalgleish et al. (2007) from their rAMT study, together with the results of the other studies discussed in this section, support an inference that at least one of the processes that underlie and mediate the connection between depression and overgenerality of AMT responses is instruction neglect – the extent to which participants are unable to retain the AMT's specificity instruction in working memory or unwilling to comply with that instruction.

Autobiographical overgenerality

Because the standard version of the AMT instructs participants to retrieve specific autobiographical memories and measures their compliance with this instruction, it is likely to confound instruction neglect (respondents' inability to retain the instruction or unwillingness to comply with it) and autobiographical overgenerality (respondents' characteristic tendency to remember their lives in overgeneral or specific terms). Two studies have resolved this confound by removing any specificity instruction from the AMT. The overgenerality or specificity of memories that respondents report in such an unconstrained condition should be a less confounded measure of the character of their spontaneous autobiographical remembering.

In the first of these two studies, Raes, Hermans, Williams and Eelen (2007) modified the AMT in two respects: First, rather than requiring participants to retrieve memories in response to cue words, participants were asked to complete eleven sentence fragments (e.g., *"I still remember well how . . ."; "Last year . . ."; "The most important thing that I have ever . . .";* etc.). Second, the participants were not given any instruction

regarding whether their responses should be specific or overgeneral. Raes et al. administered this sentence-completion minimal-instructions AMT (sc/miAMT), together with the BDI-II and the Visual Analogue Rumination Scale (VARS, a self-report of the tendency to engage in depressive rumination) to 197 university students whom the authors characterize as nonclinical.[6] The overgenerality of sc/miAMT responses was positively correlated with BDI-II scores (r = 0.18); that is, those participants with more severe self-reported depressive symptomatology tended to spontaneously retrieve more overgeneral autobiographical memories in response to the sc/miAMT (Raes et al., 2007). The overgenerality of sc/miAMT responses was also positively correlated with VARS scores (r = 0.15), that is, those participants who self-reported a greater tendency to engage in depressive rumination tended to spontaneously retrieve more overgeneral AMs in response to the sc/miAMT (Raes et al., 2007).

In the second of these two studies, Debeer, Hermans and Raes (2009) retained the AMT's cue word format, but modified the test in two other respects: First, while the traditional version of the AMT allows participants to make their responses orally, Debeer et al. required participants to write their responses. Second, Debeer et al. did not give participants any instruction regarding the specificity or overgenerality of their responses. Debeer et al. administered this written-response minimal-instructions AMT (wr/miAMT), together with the BDI-II and the Ruminative Response Scale (RRS, a self-report of the tendency to engage in depressive rumination) to 161 nonclinical university students.[7] The specificity of wr/miAMT responses was negatively correlated with BDI-II scores (r = -0.20), that is, participants who self-reported greater depressive symptomatology

[6]Raes et al. do not report their participants' BDI-II or VARS scores.

tended to spontaneously retrieve fewer specific AM's in response to the wr/miAMT. Moreover, the specificity of wr/miAMT responses was also negatively correlated with RRS scores (r = -0.28), that is, those participants with a greater self-reported tendency to engage in depressive rumination tended to spontaneously retrieve fewer specific AM's (Debeer et al., 2009).

If instruction neglect were the only mechanism underlying and mediating the association between depression and scores on the traditional version of the AMT, one would expect that depression would not correlate with scores from versions of the AMT that omit any specificity instruction. The report by Raes et al. (2007) that depression correlated with scores on the sc/miAMT, and the report by Debeer et al (2009) that depression correlated with scores on the wr/miAMT, suggest that instruction neglect is not the only mediating mechanism, but that autobiographical overgenerality may be an additional mediating mechanism. That is, the reports by Raes et al. (2007) and Debeer et al. (2009) are consistent with an inference that individuals suffering from depression tend to be overgeneral in their spontaneous, intrapsychic autobiographical remembering, and that this characteristic overgenerality is part of what the AMT measures and contributes to the association between depression and the overgenerality of AMT scores.

As noted above, Raes et al. (2007) and Debeer et al. (2009) also report that the overgenerality of responses to their minimal-instruction AMT's correlated with respondents' self-reported tendencies to engage in depressive rumination. This is relevant because Williams (2006) predicted that depressive rumination might result in

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[7] The mean of the participants' BDI-II scores was 8.81; the standard deviation was 6.84 (Debeer et al., 2009).

autobiographical overgenerality. That is, persons suffering from depression often tend to ruminate on overgeneral themes, and that ruminative overgeneral remembering may be reflected in overgeneral AMT responses. The correlations between depressive rumination and overgeneral responses to the minimal-instruction AMT's reported by Raes et al. (2007) and Debeer et al. (2009) are consistent with Williams' prediction.

In sum, although AMT scores have been reported to correlate with current depression, to persist after the remission of depression, and to predict the susceptibility to and course of future depression, it is not completely clear what the test measures. An a priori analysis of the test itself suggested that it could measure two separate processes that have been defined as (1) instruction neglect, and (2) autobiographical overgenerality. The published literature suggests that both of these processes may in fact be measured by and confounded in ATM scores, and that they both may underlie and mediate the association between depression and a tendency to retrieve overgeneral autobiographical memories in response to the AMT. As described in the next section, the study objectives of this dissertation research project are to further explore these issues.

Research objectives

The overall goal of this dissertation research project was to explore whether instruction neglect and autobiographical overgenerality are separate, dissociable processes each of which partially and separately mediates the association between depression and the overgenerality of responses to the tradition version of the AMT. Although "mediation" terminology has been used in the foregoing discussion to characterize the hypothesized causal relationships among depression, instruction neglect, autobiographical overgenerality, and a tendency to make overgeneral responses to the

AMT, a statistical mediation analysis was not within the objectives of this research project; rather, the objective here was to explore the patterns of correlations among these constructs as follows.

Depression and the standard-instructions AMT

The first specific objective of this research project was to replicate the finding of a correlation between depression and overgenerality of responses to the standard version of the AMT, and to do so with a computerized version of the AMT that was developed in the principal investigator's thesis research project (McCowin, 2007). Other than being computerized, this version of the AMT was in all respects consistent with a standard version of the test, including a specificity instruction. This test will be described in detail below, and is referred to hereinafter as the Standard-instruction Computerized AMT (siCAMT).

In the principal investigator's thesis research project, although the overgenerality of responses to the siCAMT correlated positively with a measure of executive impairment (i.e., participants with greater executive impairment tended to be overgeneral in their responses), overgenerality did not correlate with depression. Given the body of literature in which depression has been found to correlate with the overgenerality of responses to the AMT, the failure to detect any such correlation in the thesis research project was unexpected. Potential explanations for this null result were that measure of depression utilized in the thesis research project (the Zung Self-rating Depression Scale) was insufficiently reliable, and that the range of depressive symptomatology among the research participants was too narrow (McCowin, 2007).

In the current dissertation research project, the potential deficits in the design of the principal investigator's thesis research project were remedied as follows: Depression was measured with two instruments – the BDI-II and the HRSD – that have been used in prior studies in which depression has been found to correlate with the overgenerality of AMT responses (e.g., Debeer et al., 2009; Hermans et al., 2008; Raes et al., 2007; Raes et al., 2008); these two measures of depressive symptomatology are described below. Moreover, an effort was made to recruit research participants who manifested a relatively broad range of depressive symptomatology; the procedures that were employed to recruit participants for this study and the characteristics of the resulting sample of participants are described below.

Depression and a minimal-instructions AMT

The second objective of this dissertation research project was to replicate the findings reported by Raes et al. (2007) and Debeer et al. (2009) of a correlation between depression and overgenerality of responses to aversion of the AMT that omitted any specificity instruction. Neither of the minimal-instruction versions of the AMT utilized by Raes et al. (2007) or Debeer et al. (2009) was suitable for use in the present dissertation research project. As discussed above, the sc/miAMT described by Raes et al. (2007) differed from the standard version of the AMT in two respects: Not only did the sc/miAMT omit any specificity instruction, but in addition it required respondents to complete sentence fragments rather than retrieve autobiographical memories in response to cue words. Likewise, the wr/miAMT described by Debeer et al. (2009) not only omitted any specificity instruction, but also required respondents to provide written rather than oral responses. Because the sc/miAMT and the wr/miAMT each differed from the

standard version of the AMT in two respects, it would be difficult to interpret any differences between the scores on the siCAMT and the scores on either of these minimal-instruction versions of the AMT.

To facilitate comparisons between patterns of responses to the siCAMT and patterns of responses to a minimal-instruction AMT, a version of the AMT was developed and administered in the current study that differs from the siCAMT in only one respect – the omission of a specificity instruction. This minimal-instruction version of the test will be referred to hereinafter as the Minimal-instruction Computerized AMT (miCAMT), and is described in detail below. This miCAMT was utilized to attempt to replicate the findings of Raes et al. (2007) and Debeer et al. (2009).

siCAMT, executive dysfunction, and depressive rumination

Based on the literature reviewed above, it was predicted that autobiographical overgenerality and instruction neglect would both underlie and mediate the association between depression and scores on the siCAMT. It was further predicted that autobiographical overgenerality results in part from depressive rumination, and could therefore be indirectly assessed with measures of depressive rumination. Likewise, it was predicted that instruction neglect results in part from an impairment of executive functioning, and could therefore be indirectly assessed with measures of executive impairment. Based upon these predictions, it was hypothesized that scores on the siCAMT should correlate both with measures of depressive rumination and with measures of executive dysfunction. The third objective of this dissertation research project was to test this hypothesis.

miCAMT, depressive rumination, and executive dysfunction

Based on the literature reviewed above, it was predicted that autobiographical overgenerality underlies and mediates the association between depression and scores on the miCAMT, but that instruction neglect does not mediate that relationship. Therefore, it was hypothesized that scores on the miCAMT should correlate with depressive rumination, but not with executive dyscontrol. Moreover, it was hypothesized that the correlation between depressive rumination and miCAMT scores would be greater than the correlation between depressive rumination and siCAMT scores. The fourth objective of this dissertation research project was to test these hypotheses.

Research hypotheses

These research objectives are summarized in the following hypotheses:

Hypothesis 1: Depression will correlate positively with overgenerality of responses to the siCAMT.

Hypothesis 2: Depression will correlate positively with overgenerality of responses to the miCAMT.

Hypothesis 3: Scores on the siCAMT will correlate both with depressive rumination and with executive dysfunction.

Hypothesis 4: Scores on the miCAMT will correlate with depressive rumination but not with executive dysfunction.

Hypothesis 5: The correlation between scores on the miCAMT and depressive rumination will be greater than the correlation between scores on the siCAMT and depressive rumination.

CHAPTER II

METHODS

Instruments

Nine instruments were employed in this dissertation research project: the miCAMT, the siCAMT, two measures of depressive symptomatology, three measures of impairment of executive capacity, and two measures of depressive rumination. These instruments are described in detail below.

Measures of autobiographical memory

This study utilized two measures of the tendency to retrieve overgeneral autobiographical memories – the miCAMT and the siCAMT. Each of these measures is a variation on the AMT originally described by Williams and Broadbent (1986). In the miCAMT and siCAMT, as in Williams and Broadbent's original test, participants are asked to describe an autobiographical memory in response to each of a series of cue words. A participant's overgenerality score is the proportion of retrieved memories that are not single–day memories.

The miCAMT and siCAMT both differ in one respect from the test originally described by Williams and Broadbent and typically used in this body of research: Whereas the original and most common form of the AMT is administered by a researcher sitting face-to-face with each research participant, the miCAMT and siCAMT are

computer-administered. The principal investigator developed this computer-based format of the AMT as part of a thesis project (McCowin, 2007). In order to distinguish these tests from the manually-administered versions of the AMT, they will be referred to hereinafter collectively as Computerized AMTs (CAMTs).

The miCAMT and siCAMT were each created using E-Prime 1.0, running on a Compaq Pentium-4 personal computer. All of the instructions, practice items, and memory cues comprising each test are visually presented to participants on a 15- inch NEC MultiSync A700+ monitor. Simultaneously with this visual presentation, subjects hear a synchronized recording of the principal investigator's voice reading the instructions, practice items, and memory cues. This computer-based presentation allows the principal investigator to leave the testing room while participants retrieve and report autobiographical memories in response to the CAMTs' cue words, thereby minimizing experimenter effects. Moreover, the headset over which participants hear the auditory presentation screens out potentially distracting extraneous audio stimuli, thereby further standardizing the presentation of the CAMTs. The participants' responses to the cue words are picked up by a microphone incorporated into the headset and are digitally recorded for later analysis.

In all of the foregoing respects, the miCAMT and siCAMT are identical to one another. However, the two tests differ in one respect: While the siCAMT includes a specificity instruction similar to that described by Williams and Broadbent (1986), the miCAMT omits any specificity instruction. As discussed above, this difference between the two tests was intended to help dissociate autobiographical overgenerality and instruction neglect.

The miCAMT

In the miCAMT, each participant is given the following instructions via computer monitor and headset:

> *I am interested in your autobiographical memories. I am going to read out a number of words. For each one, I want you to remember something from your life that the word reminds you of.*
>
> *After I read out each word, you will have 60 seconds to think of a memory from your life that the word reminds you of, and to start telling me about it. It's fine if it takes longer than 60 seconds to describe the memory, as long as you start within the 60 seconds. Just speak into the microphone, and your memory will be recorded.*
>
> *The memory can be from any time in your life and may be about something trivial or important.*
>
> *As soon as the memory comes to you, press the "*Space*" bar and describe the memory to me. Press the "*Enter*" key when you are done.*

The participant is then presented with 15 cue words, one at a time. As stated in the instructions, after each cue word is presented, the participant has 60 seconds to begin to describe an autobiographical memory of which the cue word reminds him or her. By omitting any instruction regarding the temporal specificity of the memories participants are to retrieve, this test was designed to minimize any demand on the participant's ability and/or willingness to retain and comply with instructions, that is, it was intended to *not* measure instruction neglect. Rather,

the miCAMT was intended to measure the participant's unconstrained memory patterns, that is, his or her autobiographical overgenerality.

The siCAMT

In the siCAMT, each participant is given the following instructions via computer monitor and headset:

I am interested in more of your memories for events that have happened in your life. I will again read a number of words, and I would again like you to remember an event from your life that each word reminds you of.

You will again have 60 seconds to retrieve a memory and begin telling me about it. And once again, the event can have occurred at any time in your life, and may be trivial or important.

However, this time I would like each of your memories to be of a specific event, meaning that it lasted no longer than a single day, and that you recall some specific details about it.

For example, in response to the word "party" you could report a memory of, "Going to a party with my roommate last Monday in the Student Union," or you could report a memory of, "The surprise birthday party my parents threw for me when I turned 12."

However, it would not be appropriate to give a more extended, nonspecific memory such as, "There were lots of parties last summer." Let's begin with a few practice items.

*Tree. Now, remember a specific event from your life that this word reminds you of. As soon as the memory comes to you, press the "*Space*" bar.*

[The following appeared if a participant failed to press “Space” within 60 seconds*: Were you unable to remember an event within the 60 seconds? This is a practice item, so take as much time as you need to think of a specific event from your life that the word “tree” reminds you of. Press the “*Space*” bar when the memory comes to you. Now, tell me enough about the memory that I can tell that it was specific. Press the "*Enter*" key when you are done*.]

*Was your memory specific? That is, did you remember something that occurred on one day or less, and did you include some factual detail? If your memory was specific in this way, press the "*Enter*" key to move to the next practice item. But if your memory was nonspecific, try to think of a specific memory –one particular occasion plus some factual detail. As soon as the specific memory comes to you, press the "*Space*" bar and describe the memory to me. When you are done, press the "*Enter*" key.*

Let's try another practice item.

*Umbrella. Again, remember a specific event from your life that this word reminds you of. As soon as the memory comes to you, press the "*Space*" bar.*

[The following appeared if a participant failed to press “Space” within 60 seconds. *Were you unable to remember an event within the 60 seconds? This is a practice item, so take as much time as you need to think of a specific event from your life that the word “umbrella” reminds you of. Press the “*Space*” bar when the memory comes to you. Now, tell me enough about the memory that I can tell that it was specific. Press the "*Enter*" key when you are done*].

*If your memory was specific, press the "*Enter*" key to move to the test items. But if your memory was nonspecific, try to think of a specific memory –one particular occasion plus some factual detail. As soon as a specific memory comes to you, press the "*Space*" bar and describe the memory to me. When you are done, press the "*Enter*" key.*

*Now let's move to the test items. I will read one word at a time. After each, try to think of a specific memory. Press the "*Space*" bar when the memory comes to you, and tell me enough about the memory that I can tell it was specific. When you are done, click the "*Enter*" key.*

Each participant is then presented with 15 cue words, one at a time. As stated in the instructions, after each cue word is presented, the participant has 60 seconds to begin to describe an autobiographical memory of which the cue word reminds him or her. This siCAMT is essentially equivalent to the computerized version of the test that was developed as part of the principal investigator's thesis project (McCowin, 2007). The instructions regarding the temporal specificity of retrieved memories, together with the practice items that are intended to ensure that participants understand the specificity instructions, are similar to the instructions and practice items in the original test described by Williams and Broadbent (1986). This test was designed to measure the extent to which participants retrieve specific autobiographical memories when they are explicitly directed to do so. It therefore confounds instruction neglect and autobiographical overgenerality.

Cue Word Sets

The cue words used in the two CAMTs in this study were drawn from the sets of cue words used in two prior studies that reported finding significant correlations between depression and overgenerality of responses to the AMT. Burnside, Startup, Byatt, Rollinson, and Hill (2004) used a set of 15 cue words, five of which were intended to have a positive emotional valence (*happy, relieved, eager, sunny, proud*), five of which were intended to have a negative emotional valence (*ugly, guilty, failure, worse, hopeless*) and five of which were intended to have a neutral emotional valence (*grass, gigantic, absence, bread, search*). An additional set of 15 cue words were used by Dalgleish et al. (2007), five of which were intended to have a positive emotional valence (*love, prosperity, romance, summer, vacation*[8]), five of which were intended to have a negative emotional valence (*bereavement, cancer, depression, disease, slavery*), and five of which were intended to have a neutral emotional valence (*adolescence, century, eternity, past, permanent*). These two sets of 15 cue words were combined to form a set of 30 cue words, and that list was then divided into the following two cue sets, each containing the same number cues with positive, negative, and neutral emotional valence:

Cue Set A

adolescence	*bread*	*cancer*	*disease*	*eternity*
failure	*gigantic*	*hopeless*	*permanent*	*prosperity*
relieved	*summer*	*sunny*	*ugly*	*vacation*

[8] Dalgleish et al. (2007) used the cue word *holiday*. In order to have an equivalent cue word within modern American usage, the cue word *vacation* was substituted.

Cue Set B

absence	*bereavement*	*century*	*depression*	*eager*
grass	*guilty*	*happy*	*love*	*past*
proud	*romance*	*search*	*slavery*	*worse*

These two lists were counter-balanced between the two CAMTs: Half of the participants received the miCAMT with Cue Set A and the siCAMT with Cue Set B; the other half of the participants received the miCAMT with Cue Set B and the siCAMT with Cue Set A. Within each test, the order of cue presentation was rerandomized for each participant.

Reliability data for CAMTs

As noted above, the siCAMT is essentially equivalent to the CAMT that was developed and administered in the principal investigator's thesis research project. The coefficient alpha of responses to the CAMT in the thesis study was 0.81 (McCowin, 2007).

Measures of depression

Depressive symptomatology was measured by two well-known paper-and-pencil surveys, the BDI-II and the HRSD.

BDI-II

The BDI-II is a 21-item self-report of the severity of depressive symptomatology (Beck, Steer, & Brown, 1996). The developers of the BDI-II report coefficient alphas of 0.92 for outpatients and 0.93 for college students. The developers of the BDI-II report that its 21 items were designed to correspond to the diagnostic criteria for depression as defined in the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition

(DSM-IV, 1994), and that the correlation between scores on the BDI-II and scores on the HRSD is 0.71 (Beck et al. 1996).

HRSD

The HRSD is a 21-item structured interview that assesses the severity of depressive symptomatology (Hamilton, 1960). Coefficient alphas for the HRSD have been reported ranging from 0.73 (Riskind, Beck, Brown, & Steer, 1987) to 0.83 (Moras, di Nardo, & Barlow, 1992). In the current study, the HRSD was administered using a Structured Interview Guide for the Hamilton Depression Rating Scale which is reported to improve inter-rater reliability (J. B. Williams, 1988).

Measures of executive dysfunction

Dalgleish et al. (2007) suggest that the particular aspect of executive function that tends to be impaired in depression and that results in the overgenerality of responses to the AMT is the ability to retain and comply with the AMT's specificity instruction in the face of distraction from, and the need to inhibit, inappropriately overgeneral candidate memory responses. Therefore, in this study the impairment of executive control was operationalized with four measures that assess the capacity to withstand distractions, to inhibit inappropriate responses, and/or to retain information in working memory.

Visual Search Task

The Visual Search Task assesses the relative slowing of visual processing that is made effortful by the need to inhibit responses to distracting stimuli. In the principal investigator's thesis research project it was found that scores on the Visual Search Task correlated with the overgenerality of responses to the CAMT, that is, participants with

greater slowing in effortful processing as measured by the Visual Search Task were significantly more likely to give overgeneral responses to the AMT (McCowin, 2007).

The Visual Search Task was developed by Hammar et al. (2003b) as a measure of the impairment of effortful information processing relative to automatic information processing. Each participant is seated before a computer monitor on which appears a series of 40 stimuli screens, half of which contain a vertical black rectangle – the target – and the half of which do not. Participants are told that their reaction time is being tested, and that as quickly as possible after each screen appears, they should press the "*L*" key on a computer keyboard if the screen contains the target, and the "*A*" key if it does not. Unbeknownst to the participants, half of the screens contain vertical grey distracters and the other half do not; there are thus four classes of screens, an example of each of which is reproduced in Figure 2. One quarter of the screens contain only horizontal black rectangles and no target (exemplified by screen a in Figure 2); another quarter of the screens contain horizontal black rectangles plus one target (exemplified by screen b in Figure 2; the target has been circled for ease of reference). Scanning these two classes of screens for the presence or absence of the target is intended to be relatively easy, requiring only automatic processing (Å. Hammar, Lund, & Hugdahl, 2003a). A third quarter of the screens contain both horizontal black rectangles and vertical grey rectangles (exemplified by screen c in Figure 2); the final quarter of the screens contain one target, black horizontal rectangles, and vertical grey rectangles (exemplified by screen d in Figure 2; the target has been circled for ease of reference). The presence of the grey distracters complicates the scanning of these classes of screens for the presence or absence of the vertical black target, and is intended to be more difficult and to require

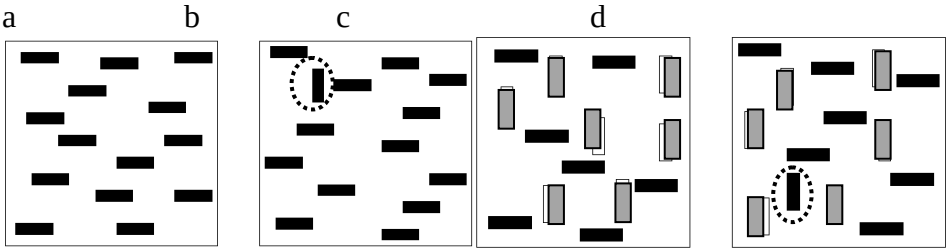

Figure 2. Examples of VST stimuli. The target vertical rectangles in screens b and d have been circled for ease of reference.

effortful processing. The measured dependent variable is the latency of a participant's responsive key stroke after the onset of each screen. Hammar et al. (2003b) reported that depression tends to slow the average latency of responses to the screens that include the vertical grey distracters, but not to slow the latency of response to the simpler screens, i.e., depression impairs effortful information processing but not automatic processing.

The version of the Visual Search Task that was utilized in the principal investigator's thesis project and in the current project uses stimuli screens provided by Dr. Hammar (2006). The test was created using E-Prime 1.0, running on a Compaq Pentium-4 personal computer. The instructions, stimuli screens, and feedback screens comprising the Visual Search Task are visually presented to participants on a 15-inch NEC MultiSync A700+ monitor. Simultaneously with the visual presentation of the Visual Search Task's instructions, participants hear a synchronized recording of the principal investigator's voice reading those instructions. The test's instructions are reproduced in Appendix A.

Participants are given four practice screens, one of each of the types reproduced in Figure 2; following each of these four practice screens the participants receive feedback on the speed and accuracy of their responses. Participants are tested with two

blocks of 20 screens each, separated by a 30-second pause. The order of presentation of the 20 stimuli screens within each of these blocks is rerandomized for each participant. No feedback is given during the test phase. The E-Prime 1.0 program automatically records the latency between the presentation of each of the 40 stimuli screens and the participant's strike of the "*L*" or "*A*" key. The mean latency (in milliseconds) of each participant's responses to simple screens is taken as that participant's automatic processing latency. The mean latency (in milliseconds) of each participant's responses to the complicated screens is taken as that participant's effortful processing latency. Each participant's automatic processing latency is subtracted from his or her effortful processing latency to yield a difference score that is taken as the relative slowing of effortful relative to automatic processing. It was this difference score that was found to correlate significantly with autobiographical overgenerality in the principal investigator's thesis project (McCowin, 2007).

In the principal investigator's thesis study, the participants' responses to the simple stimuli screens had a coefficient alpha of 0.90; responses to the complex stimuli screens had a coefficient alpha of 0.89 (McCowin 2007).

D-KEFS Inhibition and Inhibition/switching Subtests

Two of the scores provided by the Delis-Kaplan (D-KEFS) Color-Word Interference Test (Delis, Kaplan, & Kramer, 2001) were used as measures of the capacity to inhibit inappropriate responses to distracting stimuli; in addition, one of these two scores was also used as a measure of the capacity to retain and switch between two different instruction sets. The D-KEFS Color-Word Interference Test – an elaboration of the traditional Stroop task – comprises four conditions: In Condition 1, participants are

shown a page containing 50 evenly-spaced color patches (green, red, or blue) and are instructed to name the different colors as quickly as possible. The time required by a participant to complete this task is taken as a measure of his or her baseline color-naming speed. In Condition 2, participants are shown a page containing 50 evenly-spaced, printed color names (*green, red,* and *blue*) each printed in black ink, and are instructed to read the words as quickly as possible. The time required by a participant to complete this task is taken as a measure of his or her baseline word-reading speed.

In Condition 3 of the D-KEFS Color-Word Interference Test, participants are shown a page containing 50 evenly-spaced, printed color names (*green, red,* and *blue*), each of which is printed in a randomly differing color of ink (green, red, and blue). Participants are instructed to name the color of the ink in which each word is printed. The time required by a participant to complete this task is assumed to reflect his or her ability to inhibit the more automatic response of reading each word, and was used as the second measure of impairment of executive control in the present study.

In Condition 4 of the D-KEFS Color-Word Interference Test, participants are shown a page that, like the stimulus page used in Condition 3, contains 50 evenly-spaced color names, each of which is printed in a different ink color. In contrast to the Condition 3 stimulus page, however, on the Condition 4 stimulus page half of the color names are enclosed within small boxes. Participants are instructed that if a word is enclosed in one of the small boxes, then they should read the word, but that if a word is not enclosed in a box, then they should name the color of the ink in which the word is printed. The time required by a participant to complete this task is assumed to reflect both his or her inhibition capacity and his or her cognitive flexibility, i.e., the ability to retain in working

memory and to switch between two different response rules. Each participant's completion time was used as the third measure of impairment of executive control in the current study.

The D-KEFS Technical Manual (Delis et al., 2001) states that the overall test-retest reliability for the Color-Word Interference Test's Condition 3 and Condition 4 scores are, respectively, 0.75 and 0.65. However, the test-retest reliabilities differ by age group: For ages 8-19 the reliabilities are, respectively, 0.90 and 0.80; for ages 20-49 the reliabilities are, respectively, 0.71 and 0.52; and for ages 50-89 the reliabilities are, respectively, 0.75 and 0.65 (Delis et al., 2001).

Only limited information is available regarding the validity of D-KEFS Color-Word Interference Test scores. The D-DEFS Technical Manual (Delis et al., 2001) states that scores for the Color-Word Interference Test's Condition 3 correlate with the Wisconsin Card Sort Test (WCST) Categories score at r = -0.53, and with the WCST Perseverative Responses score at r = 0.23; scores for Condition 4 correlate with the WCST Categories score at r = -0.31, and with the WCST Perseverative Responses score at r = 0.20. Beaman, Pushkar, Etezadi, Bye, and Conway (2007) reported that the speed with which participants completed the traditional Stroop task (similar to Condition 3 of the D-KEFS version) loaded heavily onto a "cognitive factor" (s^2=0.67) which in turn correlated significantly with the number of specific memories retrieved in response to a version of the AMT (r^2=0.42). However, Spinhoven et al. (2006) reported that the speed with which participants completed the traditional Stroop task (similar to Condition 3 of the D-KEFS version) did not correlate significantly with the number of specific memories

retrieved in response to a version of the AMT by previously depressed but currently euthymic participants.

Operational Span Task

The Automated Operational Span Task (AOSPAN) is a computer-based working memory task that was developed and published by Unsworth, Heitz, Schrock, and Engle (2005), and that assesses the capacity to hold information in working memory while performing a distracting cognitive task. Ros, Latorre, and Serrano (2010) have reported that scores on a similar measure of working memory executive processes correlated with the number of specific memory responses to the AMT. Therefore, the AOSPAN was included in this study as a measure of the impairment of working memory in particular, and as the fourth measure of impairment of executive functioning in general.

A participant being tested with the AOSPAN sits in front of a computer screen on which is displayed a simple arithmetic formula (e.g., (1 x 2) + 1 = ?). The participant is instructed to solve the formula in his or her head, and to click the computer mouse as soon as he or she has the answer. A new screen appears on which is displayed a digit (e.g., 3) and two boxes, one containing the word “true” and the other the word “false.” The participant is instructed to click the appropriate box. A new screen appears on which is displayed a letter that the participant is supposed to remember (F, H, J, K, L, N, P, Q, R, S, T, or Y); the letter is displayed for 800ms. On the next screen is displayed another arithmetic problem, then another to-be-remembered letter, and so forth. These formula/letter pairs are grouped into 15 sets, with set sizes ranging from three to seven pairs long, and three sets of each size, for a total of 75 formula/letter pairs. The order in which the sets are presented and the particular formulas and letters that make up each set

are rerandomized for each participant. After each of the 15 formula/letter sets, the participant is asked to remember the letters in order. Although the AOSPAN calculates a number of scores, the score that was used in the present study is the total number of letters recalled in the correct position.

The developers of the AOSPAN report an estimated coefficient alpha of 0.78, and a test-retest reliability of 0.83 (Unsworth et al., 2005). AOSPAN scores have been reported to correlate with scores on a different operational span task at $r = 0.45$, and with a measure of fluid intelligence at $r = 0.38$ (Unsworth et al., 2005).

Measures of depressive rumination

Depressive rumination was assessed by two paper-and-pencil self-report measures – the Ruminative Response Scale (RRS) and the Rumination on Sadness Scale (RSS).

The RRS

The RRS is a 22-item self-report of the tendency to react to one's depression by dwelling upon the causes, symptoms, and consequences of depression. A copy of the RRS as utilized in this study is attached as Appendix B. The RRS was originally developed by Nolen-Hoeksema and Morrow, who reported a Cronbach's alpha of 0.89, and reported that RRS scores correlated significantly ($r = 0.62$) with participants' "use of ruminative responses to depressed mood in a 30-day diary study" (Nolen-Hoeksema & Morrow, 1991, p. 117).

The RRS has been utilized in a number of reported AMT studies. For example, Debeer et al. (2009) reported that RRS scores correlated at $r = -0.28$ with the specificity of responses to their wr/miAMT. Raes et al. (2005) reported that a composite score

formed by averaging standardized scores on the RRS and RSS correlated with the specificity of AMT responses at r = -0.51; Raes, Hermans, Williams, Demyttenaere et al. (2006) reported that a composite of RRS and RSS scores correlated with the specificity of AMT responses at r = -0.40.

The RSS

The RSS is a 13-item self-report of the tendency to respond to one's depression with introspective and isolating rumination. A copy of the RSS as utilized in this study is attached as Appendix C. The RSS was developed by Conway, Csank, Holm, and Blake (2000), who reported a Cronbach's alpha of 0.91 and a test-retest reliability of 0.70. Conway et al. also reported that the RSS shares more unique variance with the BDI-II than does the RRS (2000).

Like the RRS, the RSS has been used in a number of reported AMT studies. For example, Raes, Hermans, Williams, Beyers et al. (2006) reported that RSS scores correlated with the specificity of AMT responses at r = -0.43. As noted in the previous section, Raes et al. (2005) and Raes et al. (2006) reported that a composite of RRS and RSS scores correlated with the specificity of AMT responses at, respectively, r = -0.51 and at r = -0.40.

Participant recruitment

One of the limitations of the thesis project upon which this dissertation project builds was a restriction of range of depressive symptomatology among the research participants (McCowin, 2007). In order to include participants manifesting a broader range of depressive symptomatology in the present study, participants were recruited

from three sources: (1) the participant pool of the University of Utah's Department of Educational Psychology, (2) the University of Utah's Counseling Center, and (3) the mass-testing participant pool of the University of Utah's Department of Psychology.

Educational Psychology participant pool

The Department of Educational Psychology at the University of Utah has organized a participant pool as a source of research participants for student and faculty research projects. This participant pool comprises students at the University of Utah who are enrolled in EDPS 2600, 3030, 3110, and 5151, and who, as part of the requirements for those courses, are required either to participate in research projects for a set number of hours or to complete a short research project of their own. This pool has received separate approval from the University of Utah's Institutional Review Board (IRB).

Participants were recruited from this participant pool as follows: At the beginning of each university semester, a list of available research projects in which students in EDPS 2600, 3030, 3110, and 5151 could participate to satisfy their research participation requirement was published on an internet web page. Students were allowed to select among the available research projects. The web page provided space for students to sign up for research participation appointments at predetermined times. The web page also informed students of the location of the room where all testing for the present research project was conducted. Upon their arrival at the testing room at the appointed time, students were given a brief overview of the research project and an informed consent document that had been approved by the IRB. (A copy of the IRB-approved informed consent document is attached as Appendix D). If the students executed the informed

consent document (in fact, not a single student declined to execute the document), then testing immediately commenced.

This participant pool was the source from which the bulk of research participants for the principal investigator's thesis project was recruited. Based on that experience, it was anticipated that no more than 5 to 10% of participants recruited from this participant pool would manifest any significant level of depressive symptomatology. In fact, the mean of the BDI-II scores of the 42 participants recruited from the Educational Psychology participant pool for the current research project was 7.52, which is in the range suggesting minimal depression symptomatology. Of these 42 participants, 38 had BDI-II scores in the 0 and 13 range, suggestive of minimal depressive symptomatology;1 had a BDI-II score in the 14 and 19 range, suggestive of mild depressive symptomatology; 3 had BDI-II scores in the 20 and 28 range, suggestive of moderate depressive symptomatology; and 0 had BDI-II scores of 29 or above, which would have been suggestive of severe depression (Beck et al., 1996).

University of Utah Counseling Center

In order to recruit participants manifesting a higher severity of depressive symptomatology, participants for the current research project were also recruited from among the clients of the University of Utah's Counseling Center (UCC) as follows: The UCC's receptionists were briefed on the nature of this research project and were given a supply of blank informed consent documents. The receptionists then mentioned this research project to ongoing UCC clients and/or new UCC clients at the outset of their initial intake appointments. The receptionists told such prospective participants that they would receive two free coupons exchangeable for movie tickets at a local chain of

theaters as compensation for participating in the research. Any UCC client who was interested in participating in the project was given a copy of the informed consent document and asked to read through it. If the UCC client was still interested in participating in the project, the client was asked to write his or her telephone number on the informed consent document, and to execute the document indicating his or her interest in participating in the project and authorizing the UCC to disclose his or her name and telephone number to the principal investigator. The executed informed consent documents were periodically collected from the UCC, and the prospective research participants were contacted to schedule testing appointments.

It was not logistically possible to limit recruitment of UCC clients to those who had been diagnosed with depression and/or were experiencing depressive symptomatology. Nevertheless, it was expected that UCC clients would manifest a higher severity of depressive symptomatology than research participants recruited from the Educational Psychology participant pool. In fact, the mean of the BDI-II scores of the 15 participants recruited from the UCC for the current research project was 16.2, which is within the range suggesting mild depression. Of these 15 participants, 6 had BDI-II scores in the 0 to 13 range, suggestive of minimal depressive symptomatology; 6 had BDI-II scores in the 14 and 19 range, suggestive of mild depressive symptomatology; 1 had a BDI-II score in the 20 and 28 range, suggestive of moderate depressive symptomatology; and 2 had BDI-II scores of 29 or above, suggestive of severe depression (Beck et al., 1996).

Psychology mass-testing participant pool

In order to recruit more research participants manifesting an elevated severity of depressive symptomatology, participants who had endorsed such symptomatology on mass-testing were recruited from the participant pool organized by the Department of Psychology at the University of Utah. This participant pool, which has received separate IRB approval, comprises students at the University of Utah who are enrolled in PSY 1010. At the beginning of each semester, all of these students undergo mass-testing, i.e., they are administered a battery of tests that assess them on a variety of issues. In order to identify students who endorsed an elevated severity of depressive symptomatology, 10 depression-screening questions assessing typical symptoms of depression were included in the mass-testing battery. (A copy of the 10 depression-screening questions is attached as Appendix E.) The Department of Psychology communicated to the principal investigator the names, test scores, and contact information of the students who participated in mass testing. Research participants were recruited from among those with the highest scores on the 10 depression-screening questions.

Although the depression-screening scores of research participants recruited from the Psychology mass-testing participant pool were not included in the data analysis in this research project, on the basis of these participants' elevated depression-screening scores, it was anticipated that they would manifest elevated depressive symptomatology as measured by the BDI-II. In fact, the mean BDI-II score of the 18 participants recruited from the Psychology mass-testing participant pool for the current research project was 20.56, which is in the range suggesting moderate depression. Of these 18 participants, 5 had BDI-II scores in the 0 to 13 range, suggestive of minimal depressive

symptomatology; 3 had BDI-II scores in the 14 to 19 range, suggestive of mild depressive symptomatology; 5 had BDI-II scores in the 20 to 28 range, suggestive of moderate symptomatology, and 5 had BDI-II scores of 29 or greater, suggestive of severe depression (Beck et al., 1996).

Overall, this participant recruitment procedure succeeded in increasing the range of depressive symptomatology among the research participants in this study. A total of 76 participants were recruited from these three sources. Data from 1 participant were lost because of technical problems with the computer equipment. Of the remaining 75 participants, 49 had BDI-II scores in the 0 to 13 range, suggestive of minimal depressive symptomatology;10 had BDI-II scores in the 14 to 19 range, suggestive of mild depressive symptomatology; 9 had BDI-II scores in the 20 to 28 range, suggestive of moderate depressive symptomatology; and 7 had BDI-II scores of 29 or above, suggestive of severe depression.

Procedure

Participants were tested individually in a single, preappointed testing session lasting approximately one hour and 40 minutes. The principal investigator personally administered all of the testing in Room 308F of Milton Bennion Hall at the University of Utah. All of the testing was conducted during the UCC business hours to allow immediate referral to the UCC should any participant become acutely distressed by the testing experience. This referral procedure was not in fact utilized during any of the testing in this project.

Upon each participant's arrival at a testing session, the principal investigator provided him or her with two copies of the Consent Document (one for the participant to

retain and one to be retained by the principal investigator; in the case of UCC clients, one of the copies was the document that the participant had previously signed). Each participant was then given a verbal overview of the phases of the testing as detailed below, and was given the opportunity to ask questions about the project. Very few participants had any such questions. On a very limited number of occasions, a participant asked questions a full answer to which would have threatened the validity of testing results; in these instances, in accordance with the informed consent document, the participant was told that full answers to his or her questions would be provided at the end of testing. The participant was then asked to execute the informed consent document indicating his or her informed consent to participate in the project. (UCC clients were asked to execute the unsigned copy of the consent document.)

Before testing commenced, each participant was informed that his or her responses would be held strictly confidential and would be identified only by an anonymous participant number. Each participant was informed that confidentiality was subject only to exceptions in the case of threatened imminent harm to self or an identified other, or in the case of reported abuse. At no point during the testing in this research project did any exception to confidentiality need to be invoked.

The sequence of testing of each participant was conducted according to one of two alternating checklists – Protocol Order #1 and Protocol Order #2 (attached as Appendix F). The initial four instruments were the same for each of these checklists: the miCAMT, the siCAMT, the BDI-II and the HRSD were administered to each participant in that order. However the order of administration of the remaining instruments was counter-balanced so as to limit any order effects.

Each participant was asked to take a seat at a computer terminal in the testing room and was given brief verbal instructions regarding the operation of the computer (use of the mouse, clicking in on-screen boxes to advance, speaking into the microphone, etc.). The principal investigator then started the miCAMT and left the testing room. All of the miCAMT's instructions and stimuli were presented via a computer screen and headphones, and the participant's oral responses were digitally recorded for later scoring. The miCAMT typically took approximately 10 minutes to complete. At the conclusion of the miCAMT, the participant was instructed via the computer screen and headphones to alert the principal investigator that he or she had finished.

The principal investigator then re-entered the testing room and collected basic demographic information (gender and age). The principal investigator then started the computer-based siCAMT and again left the testing room. All of the siCAMT's instructions and stimuli were presented via a computer screen and headphones, and the participant's oral responses were digitally recorded for later scoring. The siCAMT typically took approximately 15 minutes to complete. At the conclusion of the siCAMT, the participant was again instructed via the computer screen and headphones to alert the principal investigator that he or she had finished.

The principal investigator then re-entered the testing room, briefly explained the BDI-II and asked the participant to fill out that self-report. The principal investigator remained in the testing room to respond to any questions the participant might have about the BDI-II. When the participant had completed the BDI-II, the principal investigator administered the HRSD. These two assessments typically took approximately 20 minutes

to complete. The principal investigator then told the participant that the testing protocol required a brief break, and engaged in informal small-talk to fill that break.

The order of the remaining assessments depended upon whether the participant was being assessed using Protocol Order #1 or Protocol Order #2. Pursuant to Protocol Order #1, the principal investigator next administered the D-KEFS Color-Word Interference Test; this assessment typically took approximately 5 minutes to complete. The principal investigator then asked the participant to complete the RRS self-report; this assessment typically took 3 or 4 minutes to complete. The principal investigator then started the computer-based Visual Search Task and left the testing room. All of the Visual Search Task's instructions and stimuli were presented via a computer screen and headphones. Completion of this assessment typically took approximately 5 minutes. At the conclusion of the Visual Search Task, the participant was instructed to alert the principal investigator that he or she had finished. The principal investigator then informed the participant that the testing protocol required another brief break, and again engaged in informal small-talk to fill the break. The principal investigator then asked the participant to complete the RSS self-report; this assessment typically took 2 or 3 minutes to complete. The principal investigator then started the computer-based AOSPAN and left the room. All of the AOSPAN's instructions and stimuli were presented via a computer screen; there was no audio component to this test and the headphones were consequently not needed. The AOSPAN typically took approximately 15 minutes to complete.

If the participant were being assessed pursuant to Protocol Order #2 rather than #1, then the last 5 assessments were be presented in the following sequence: AOSPAN, RSS, Visual Search Task, brief break, RRS, and D-KEFS Color-Word Interference Test.

After the completion of all testing, each participant was debriefed in accordance with the Debriefing Outline attached as Appendix G and was allowed to ask any questions relevant to the research project. Participants recruited from the UCC were then given two movie tickets. All participants were asked not to discuss the details of the autobiographical memory assessments with other prospective participants.

CHAPTER III

RESULTS

Description of data collected

Equivalence of counterbalanced factors

The mean miCAMT score for the 39 participants who received cue word set A in that test was 0.23 (*SD* = 0.18); the mean miCAMT score for the 36 participants who received cue word set B in that test was 0.28 (*SD* = 0.18). These two mean scores were not significantly different ($t(73) = -1.14$, $p = 0.26$ (2-tailed)).

The mean siCAMT score for the 39 participants who received cue word set A in that test was 0.76 (*SD* = 0.20); the mean siCAMT score for the 36 participants who received cue word set B in that test was 0.75 (*SD* = 0.16). These two mean scores were not significantly different ($t(73) = 0.02$, $p = 0.98$ (2-tailed)).

The mean score on condition 3 of the D-KEFS Color-Word Interference Test for the 39 participants who were assigned to protocol order number 1 was 44.97 (*SD* = 8.70); the mean score on that test for the 36 participants who were assigned to protocol order number 2 was 47.81 (*SD* = 9.97). These two means were not significantly different ($t(73) = -1.31$, $p = 0.19$ (2-tailed)).

The mean score on condition 4 of the D-KEFS Color-Word Interference Test for the 39 participants who were assigned to protocol order number 1 was 50.36 (*SD* = 9.05); the mean score on that test for the 36 participants who were assigned to protocol order

number 2 was 53.03 (*SD* = 9.05). These two means were not significantly different (*t*(73) = -1.28, *p* = 0.21 (2-tailed)).

The mean composite depressive rumination score of the 39 participants who were assigned to protocol order number 1 was -0.26 (*SD* = 2.02); the mean composite rumination score of the 36 participants who were assigned to protocol order number 2 was 0.28 (*SD* = 1.78). These two means were not significantly different (*t*(73) = -1.25, *p* = 0.22 (2-tailed)).

The mean score on the Visual Search Task for the 39 participants who were assigned to protocol order number 1 was 211.56 (*SD* = 133.45); the mean score on that test for the 36 participants who were assigned to protocol order number 2 was 199.21 (*SD* = 112.64). These two means were not significantly different (*t*(73) = 0.43, *p* = 0.67 (2-tailed)).

The mean OSPAN score of the 39 participants who were assigned to protocol order number 1 was 54.44 (*SD* = 13.20); the mean score on that test for the 34 participants who were assigned to protocol order number 2 was 55.91 (*SD* = 15.57). These two means were not significantly different (*t*(71) = -0.44, *p* = 0.66 (2-tailed)).

Thus, counterbalancing the participants on cue set and protocol order did not have any significant effects on the relevant outcome variables.

Participant characteristics

N

Seventy-six participants were originally recruited to participate in this project. Data from 1 participant were lost due to a computer error. Data from the remaining 75 participants are reported.

Age

As summarized in Figure 3, the participants ranged in age from 18 to 47, with a mean age of 24.2 and a standard deviation of 5.7 years.

Sex

As summarized in Figure 4, 46 of the participants (61%) were female. Twenty-nine of the participants (39%) were male.

miCAMT scores

As summarized in Figure 5, scores on the miCAMT ranged from 0.0 to 0.75. The mean score was 0.25 and the standard deviation was 0.18. The Cronbach's alpha for participants who received cue set A in the miCAMT was 0.61. For participants who received cue set B in the miCAMT, the Cronbach's alpha was 0.52. The Cronbach's alpha for all participants' responses to the miCAMT was 0.58.

siCAMT scores

As summarized in Figure 6, scores on the siCAMT ranged from 0.27 to 1.0. The mean score was 0.76, and the standard deviation was 0.18. The Cronbach's alpha for participants who received cue set A in the siCAMT was 0.57. For participants who received cue set B in the siCAMT, the Cronbach's alpha was 0.77. The Cronbach's alpha for all participants' responses to the siCAMT was 0.69.

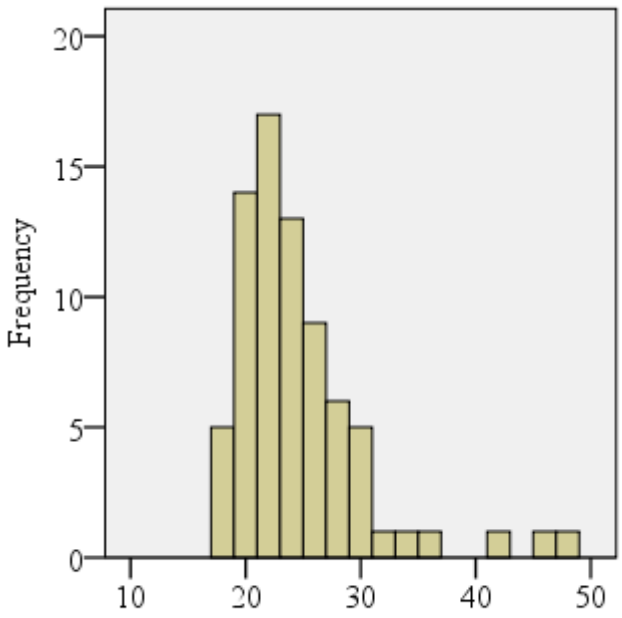

Figure 3. Participant age distribution.

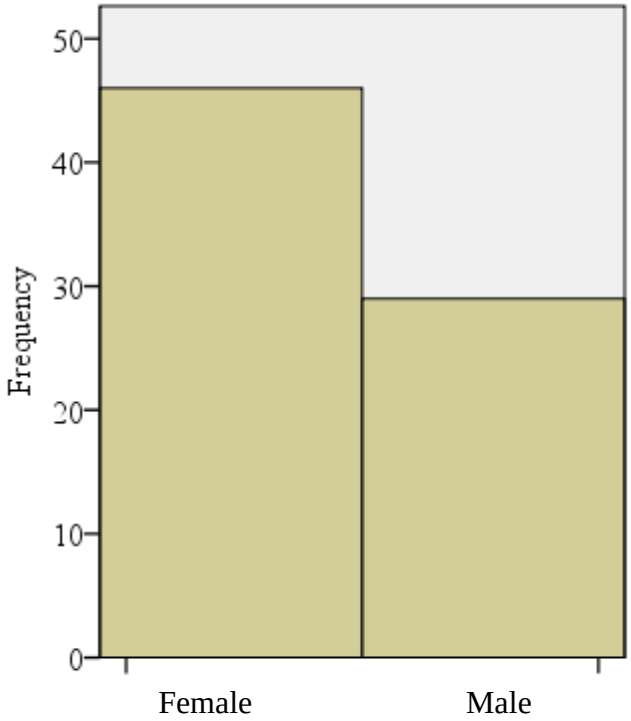

Figure 4. Participant sex distribution.

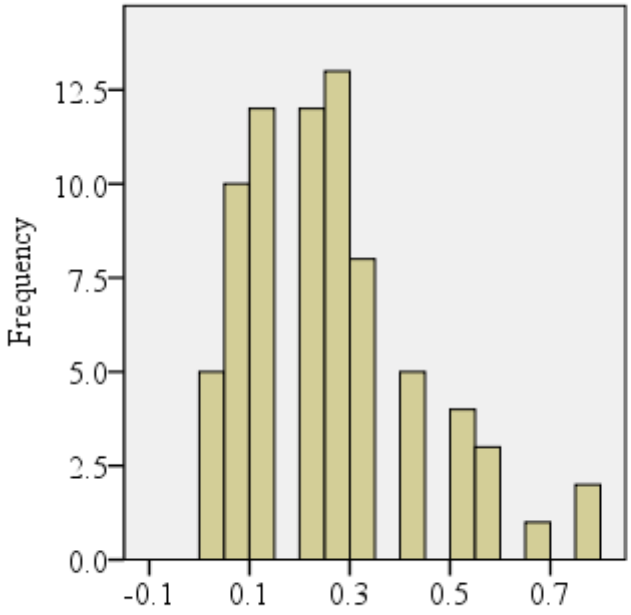

Figure 5. miCAMT scores.

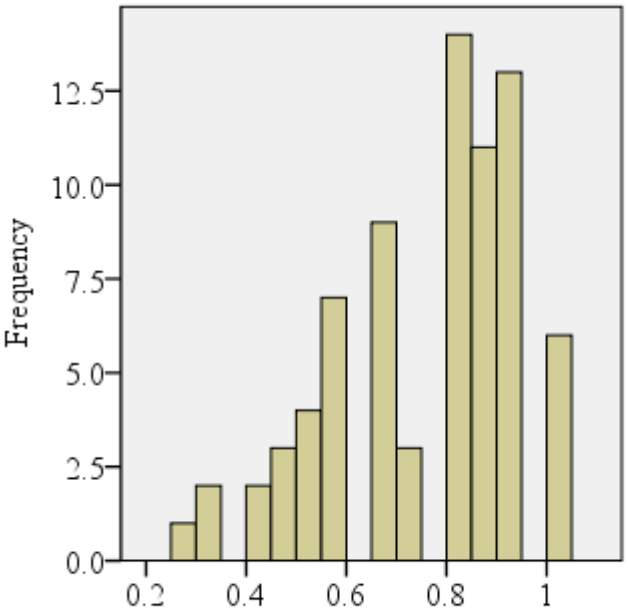

Figure 6. siCAMT scores.

Depression scores

BDI-II scores

As summarized in Figure 7, the participants' scores on the BDI-II ranged from 0 to 33. The mean score was 12.39, and the standard deviation was 9.05. Forty-nine of the participants' scores fell in the range of 0 to 13, suggesting minimal depression. Ten of the participants' scores fell in the range of 14 to 19, suggesting mild depression. Nine of the participants' scores fell in the range of 20 to 28, suggesting moderate depression. The remaining 7 participants' scores were 29 or above, suggesting severe depression. The Cronbach's alpha for the participants' responses to the BDI-II was 0.91.

HRSD scores

As summarized in Figure 8, the participants' scores on the HRSD ranged from 0 to 36. The mean score was 12.17, and the standard deviation was 7.77. The Cronbach's alpha for the participants' responses to the HRSD was 0.85.

Composite depression scores

Scores on the BDI-II were highly correlated with scores on the HRSD (r (74) = 0.83, $p< 0.01$).This association supports an inference that the two measures converge on a common construct, and therefore supports combining the scores on the BDI-II and HRSD into a composite depression score. To form this composite score, z-scores were calculated for BDI-II and HRSD scores based on the sample of participants in this study. Each participant's BDI-II z-score and HRSD z-score was summed to yield that participant's composite depression score. As summarized in Figure 9, the composite

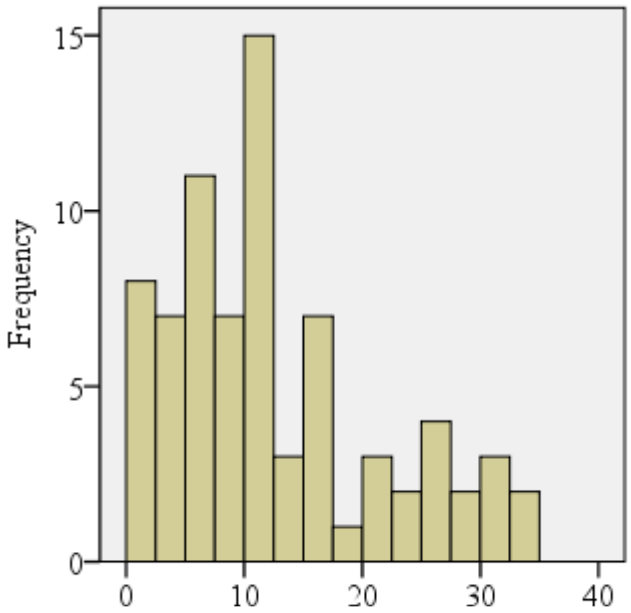

Figure 7. BDI-II scores.

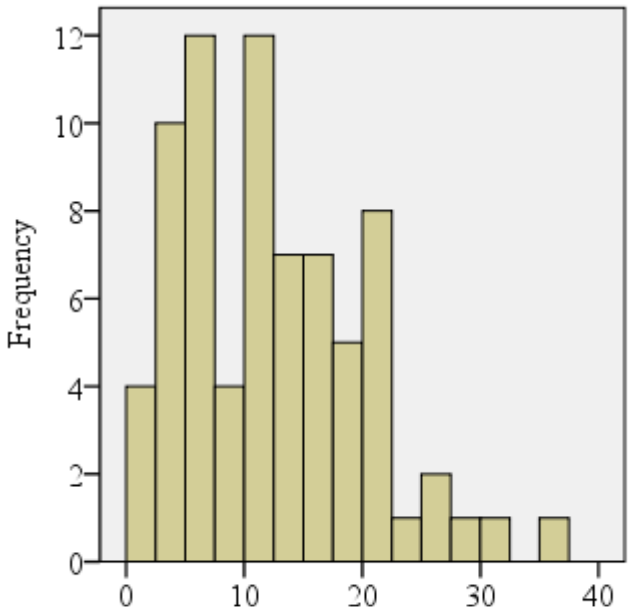

Figure 8. HRSD scores.

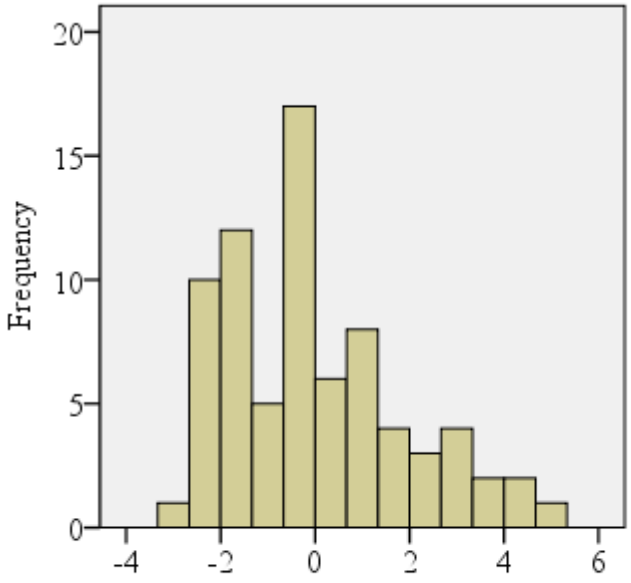

Figure 9. Composite Depression scores.

depression scores ranged from -2.94 to 4.90. The mean score was 0.0 and the standard deviation was 1.9.

Executive dysfunction scores

Visual search task scores

As summarized in Figure 10, the participants' mean latencies to respond to noncomplicated stimuli in the Visual Search Task (i.e., automatic processing) ranged from 393ms to 1222ms. The mean response latency to noncomplicated stimuli was 737ms and the standard deviation was 167ms. Cronbach's alpha was 0.80.

As summarized in Figure 11, the participants' mean latencies to respond to the complicated stimuli in the Visual Search Task (i.e., effortful processing) ranged from 472ms to 1480ms. The mean response latency to complicated stimuli was 943ms and the standard deviation was 205ms. Cronbach's alpha was 0.90.

As summarized in Figure 12, the differences between each participant's mean automatic processing latency and mean effortful processing latency ranged from -194ms to 461ms. The mean difference was 206ms and the standard deviation was 123ms.

D-KEFS Color-Word Interference scores

As summarized in Figure 13, the participants' raw scores on the Inhibition Condition of the D-KEFS Color-Word Interference Test ranged from 30 seconds to 74 seconds. The mean score was 46 seconds, and the standard deviation was 9 seconds.

As summarized in Figure 14, the participants' raw scores on the Inhibition/Switching Condition of the D-KEFS Color-Word Interference Test ranged

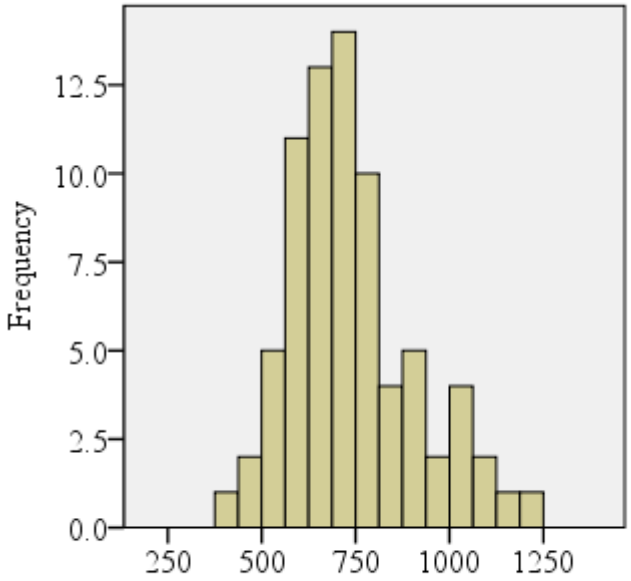

Figure 10. VST automatic processing (ms).

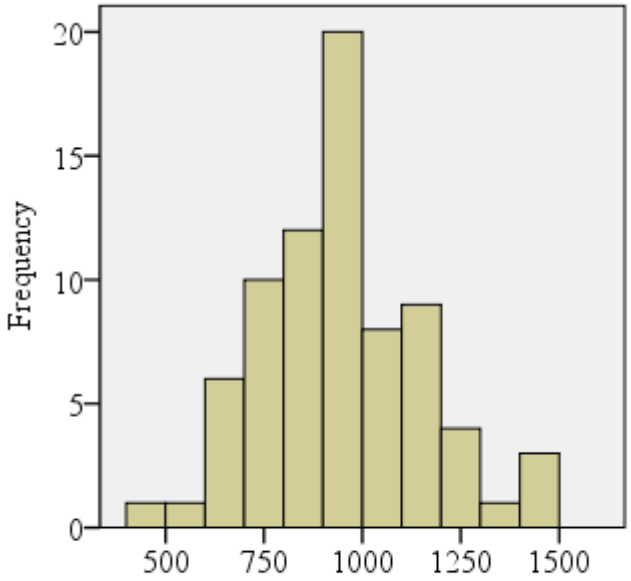

Figure 11. VST effortful processing (ms).

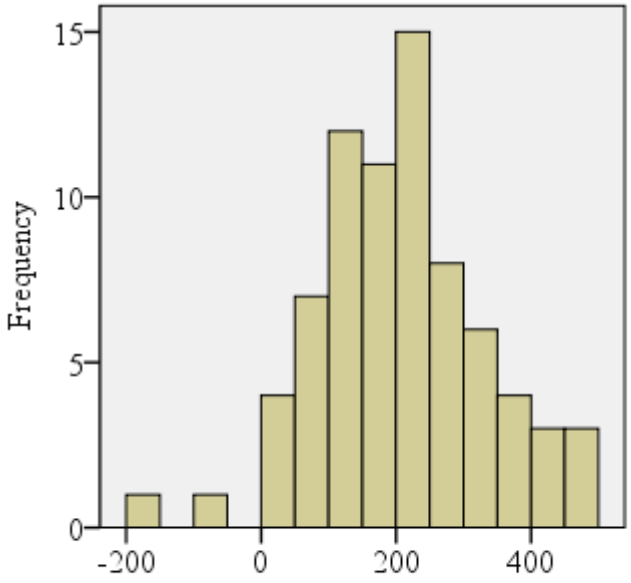

Figure 12. VST effort – automatic (ms).

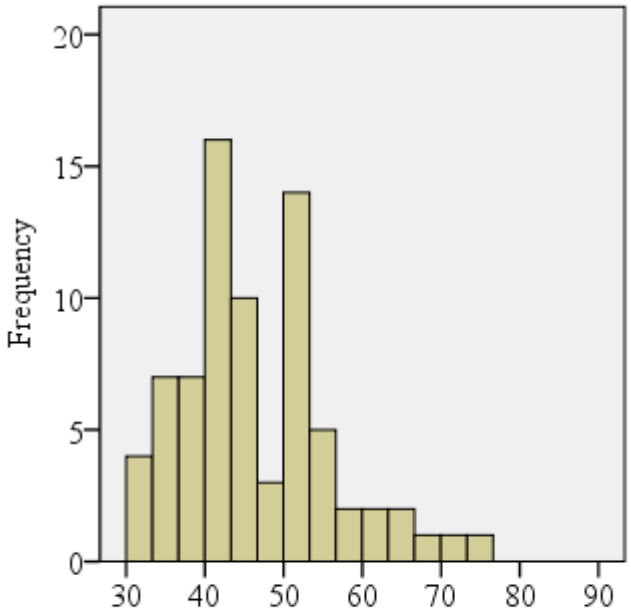

Figure 13. Color-Word Inhibition (sec).

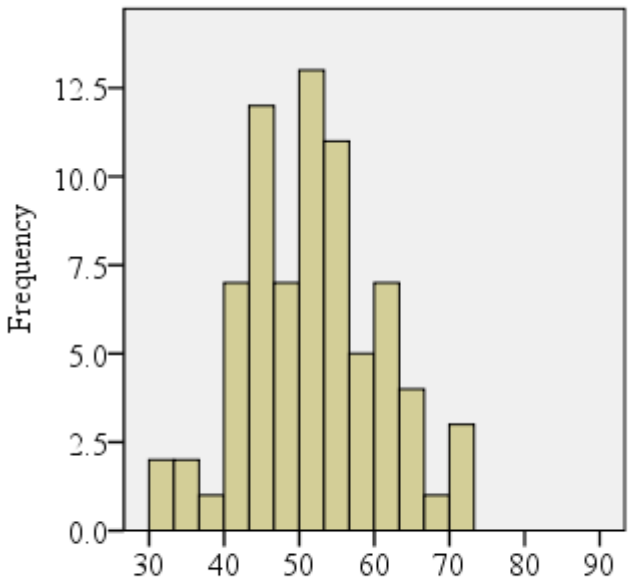

Figure 14. Color-Word Inhibition/Switching (sec).

from 31 seconds to 73 seconds. The mean score was 52 seconds, and the standard deviation was 9 seconds.

Operational Span Task scores

As summarized in Figure 15, the participants' AOSPAN Total Scores ranged from 9 to 75. The mean score was 55 and the standard deviation was 14.

The correlations among these four measures of impairment of executive function were modest and/or insignificant: Visual Search Task scores did not correlate with scores on the Inhibition Condition of the D-KEFS Color-Word Interference Test (r (74) = 0.04, p = 0.75), scores on the Inhibition/Switching Condition of the D-KEFS Color-Word Interference Test (r (74) = 0.01, p = 0.91), or scores on the OSPAN (r (74) = 0.07, p = 0.54). Scores on the Inhibition Condition of the D-KEFS Color-Word Interference Test were modestly correlated with scores on the Inhibition/Switching Condition of the D-KEFS Color-Word Interference Test (r (74) = 0.48, p<0.01) and with scores on the OSPAN (r (74) = -0.31, p< .01). Scores on the Inhibition/Switching Condition of the D-KEFS Color-Word Interference Test were modestly correlated with scores on the OSPAN (r (74) = -0.27, p< 0.05). The lack of any strong associations among the data collected with these four measures suggests that they do not measure a single unified construct. The scores on these measures were therefore not combined to form a composite variable. Rather, each of the four measures was analyzed separately.

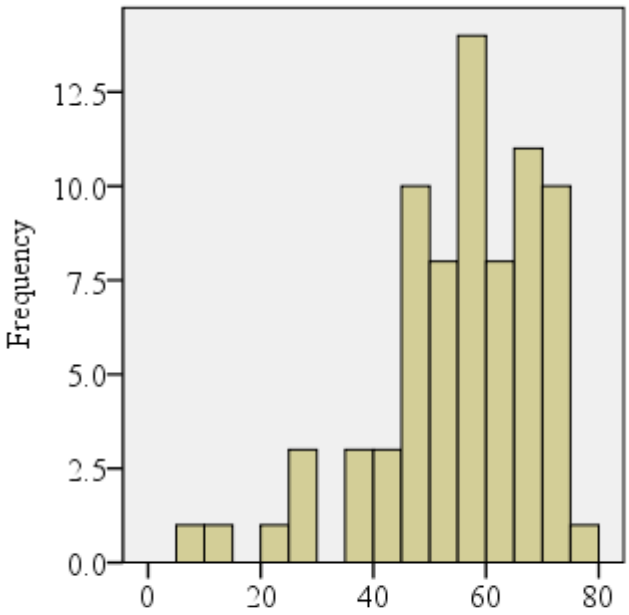

Figure 15. OSPAN Total scores.

Depressive rumination scores

RRS

As summarized in Figure 16, the participants' scores on the RRS ranged from 23 to 69. The mean score was 40 and the standard deviation was 12. The Cronbach's alpha for RRS scores of participants in this study was 0.94.

RSS

As summarized in Figure 17, the participants' scores on the RSS ranged from 13 to 53. The mean score was 26 and the standard deviation was 11. The Cronbach's alpha for RSS scores of participants in this study was 0.94.

Composite depressive rumination scores

Scores on the RRS were highly correlated with scores on the RSS (r (74) = 0.84, $p< 0.01$). This association supports an inference that the two measures converge on a common construct, and therefore supports combining the scores on the RRS and RSS into a composite depressive rumination score. To form this composite score, *z*-scores were calculated for RRS scores and RSS scores based on the sample of participants in this study. Each participant's RRS *z*-score and RSS *z*-score was summed to yield that participant's composite depressive rumination score.

As summarized in Figure 18, the participants' composite depressive rumination scores ranged from -2.48 to 4.26. The mean was 0.0 and the standard deviation was 1.92.

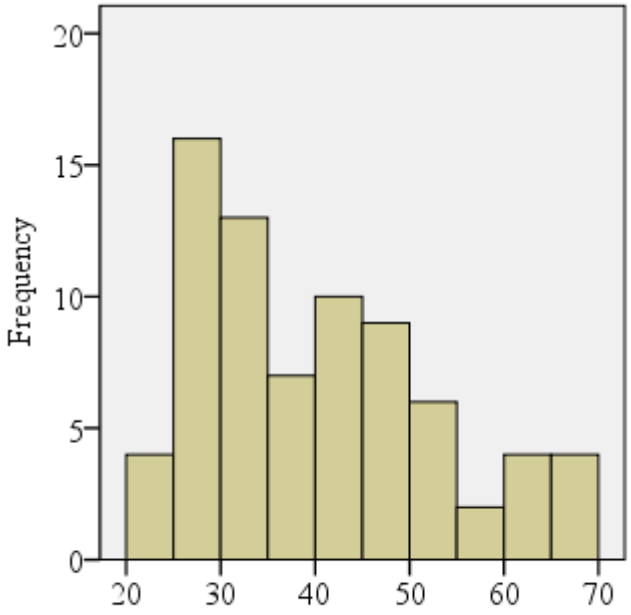

Figure 16. RRS scores.

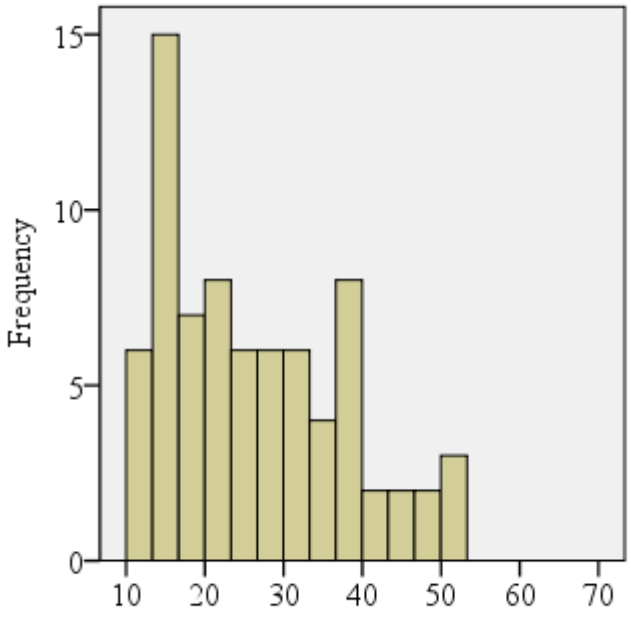

Figure 17. RSS scores.

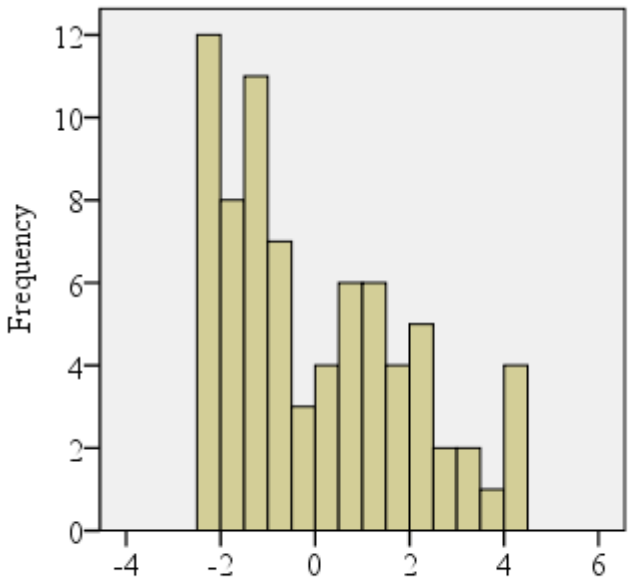

Figure 18. Composite Depressive Rumination.

Confirmatory analysis

As set forth above, the research hypotheses upon which this dissertation project was structured are stated in terms of predicted correlations among the variables that were measured and derived in this study. The observed correlations are set forth in Table 3. As discussed below in connection with the individual research hypotheses, the data collected in this study fail to support any of those hypotheses.

Table 3. Correlation table. ** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

	miCAMT	siCAMT	Depression	Rumination	VST	Stroop Inhib	Stroop Inh/Swit	OSPAN
miCAMT	1	.430**	-.053	-.144	-.031	-.104	-.057	-.008
		.000	.655	.218	.793	.372	.630	.947
siCAMT		1	.092	.063	.033	-.129	-.122	.153
			.435	.592	.781	.271	.299	.192
Depression			1	.731**	-.015	.176	.091	-.079
				.000	.897	.130	.438	.505
Rumination				1	.080	.046	-.030	-.012
					.492	.693	.801	.917
VST					1	.038	.013	.072
						.748	.912	.541
Stroop Inhib						1	.479**	-.313**
							.000	.007
Stroop Inhib/Switch							1	-.265*
								.023
OSPAN								1

Hypothesis 1

The first research hypothesis was that depression would correlate positively with the overgenerality of responses to the siCAMT. Contrary to that hypothesis, depression, operationalized as the sum of each participant's *z*-scores on the BDI-II and HRSD, was not found to correlate with siCAMT scores ($r(74) = 0.09$, $p = 0.44$). Post-hoc analyses were conducted to test whether this null result might be an artifact of some aspect of the research design or of the form (as opposed to the content) of the data collected.

To test whether the null result might have been caused by forming a composite depression variable from BDI-II and HRSD scores, separate correlations were calculated between siCAMT scores and BDI-II scores, and between siCAMT scores and HRSD scores. Neither BDI-II scores ($r(74) = 0.04$, $p = 0.76$) nor HRSD scores ($r(74) = 0.14$, $p = 0.24$) were found to correlate with siCAMT scores. This suggests that deriving a composite depression score comprising BDI-II scores and HRSD scores did not cause the null result with respect to the first research hypothesis.

To test whether the null result might have been caused by recruiting participants from three different populations – the Educational Psychology Participant Pool, the University Counseling Center, and the Psychology Mass-testing Participant Pool – separate correlations were calculated for participants recruited from each source.

Among participants recruited from the Educational Psychology Participant Pool, the mean BDI-II score was 7.5 ($SD = 6.0$), the mean HRSD score was 8.1 ($SD = 5.5$), and the mean composite depression score was -1.1 ($SD = 1.3$). Histograms summarizing the depression scores of this subgroup of participants are included as Figures 19, 20, and 21. Among participants recruited from the University Counseling Center, the mean BDI-

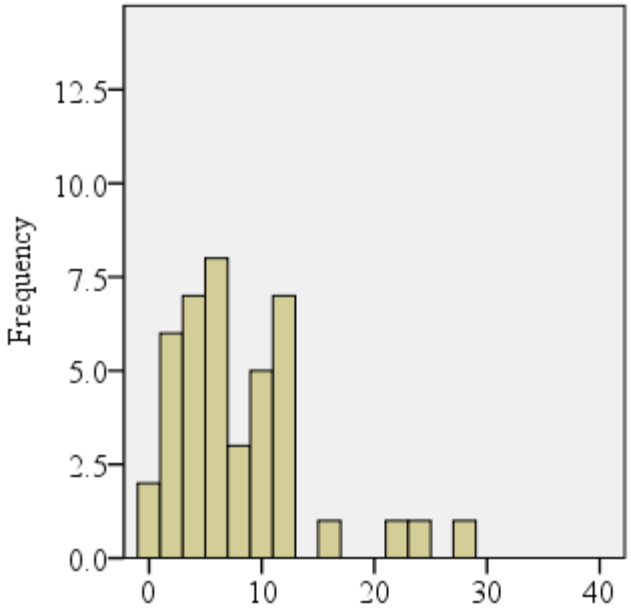

Figure 19. EdPs BDI-II scores.

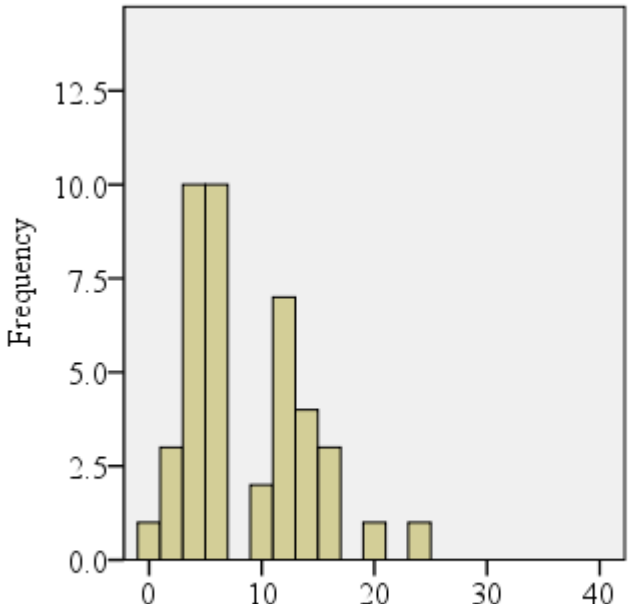

Figure 20. EdPs HRSD scores.

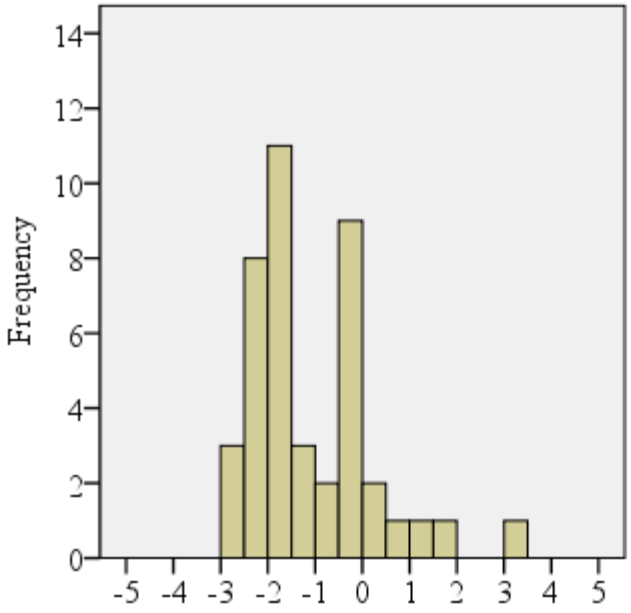

Figure 21. EdPs Composite Depression.

II score was 16.2 (*SD* = 7.0), the mean HRSD score was 17.0 (*SD* = 7.9), and the mean composite depression score was 1.0 (*SD* = 1.7). Histograms summarizing the depression scores of this subgroup of participants are included as Figures 22, 23, and 24. Among participants recruited from the Psychology Mass-testing Participant Pool, the mean BDI-II score was 20.6 (*SD*= 9.3), the mean HRSD score was 17.7 (*SD* = 6.6), and the mean composite depression score was 1.6 (*SD* = 1.7). Histograms summarizing the depression scores of this subgroup of participants are included as Figures 25, 26, and 27. As demonstrated by the respective mean depression scores of these three subgroups, and as illustrated by the histograms, the participants within the three groups present differing levels of depressive symptomatology. This was the intent of recruiting participants from these three different sources – to sample a broad range of depressive symptomatology. For ease of comparison, histograms reflecting depressive symptomatology within the aggregate sample are reproduced as Figures 28, 29, and 30.

Correlations between siCAMT scores and each of the three depression scores (BDI-II scores, HRSD scores, and composite depression scores) were calculated separately for participants recruited from each of the three sources. For participants recruited from the Educational Psychology Participant Pool, no correlation was found between siCAMT scores and BDI-II scores ($r(41) = 0.19$, $p = 0.24$), HRSD scores ($r(41) = 0.05$, $p = 0.75$), or composite depression scores ($r\ (41) = 0.12$, $p = 0.44$). For participants recruited from the University Counseling Center, no correlation was found between siCAMT scores and BDI-II scores ($r(14) = 0.42$, $p = 0.12$); however, siCAMT scores did correlate with HRSD scores ($r(14) = 0.52$, $p = 0.05$) and composite depression scores ($r(14) = 0.52$, $p = 0.05$. For participants recruited from the Psychology Mass-

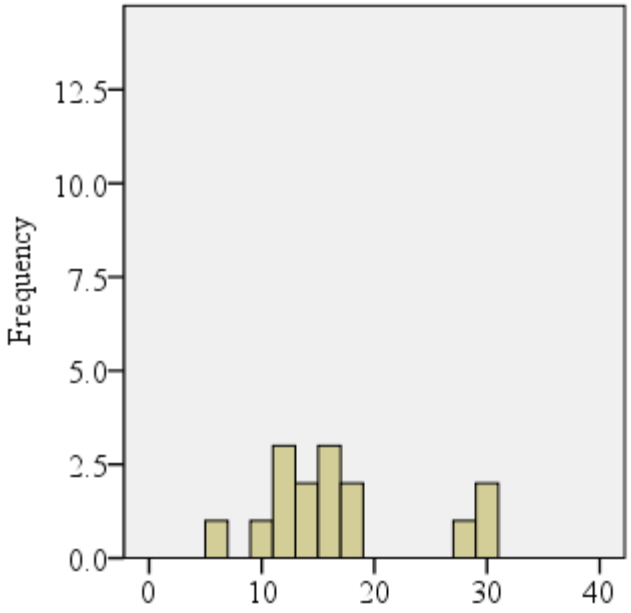

Figure 22. UCC BDI-II scores.

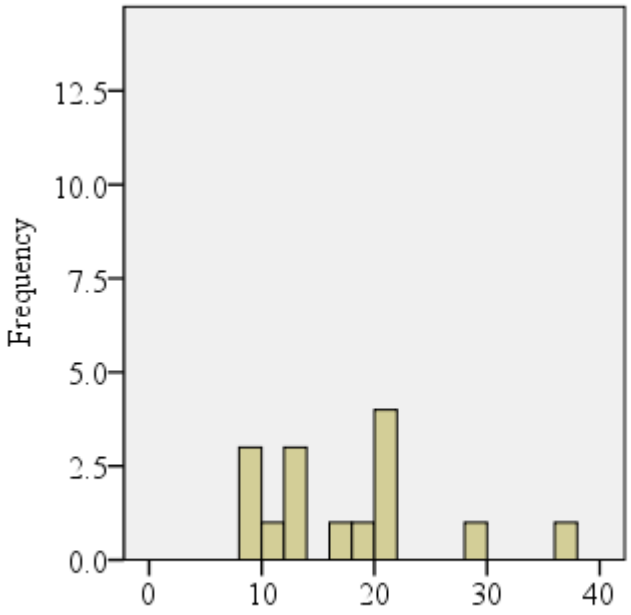

Figure 23. UCC HRSD scores.

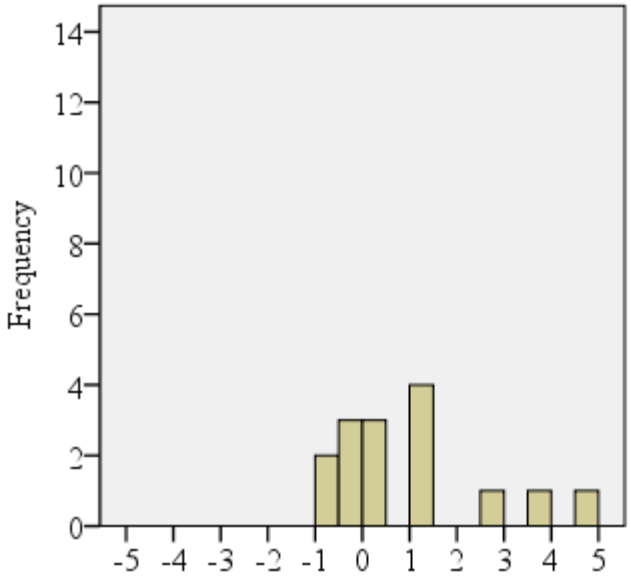

Figure 24. UCC Composite Depression.

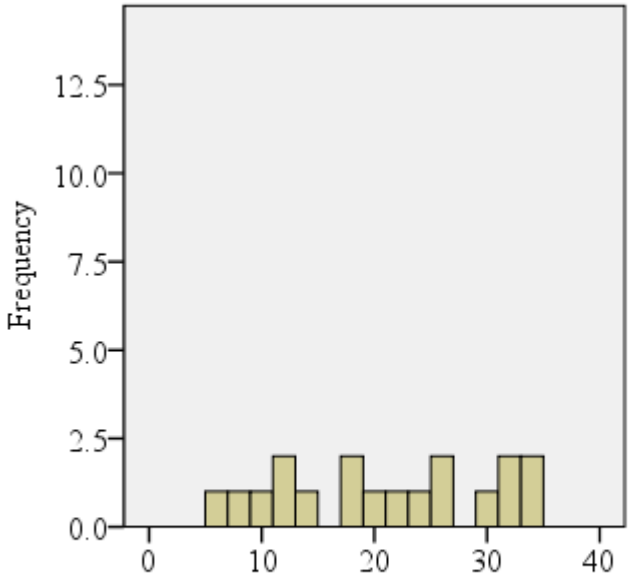

Figure 25. Psychology BDI-II scores.

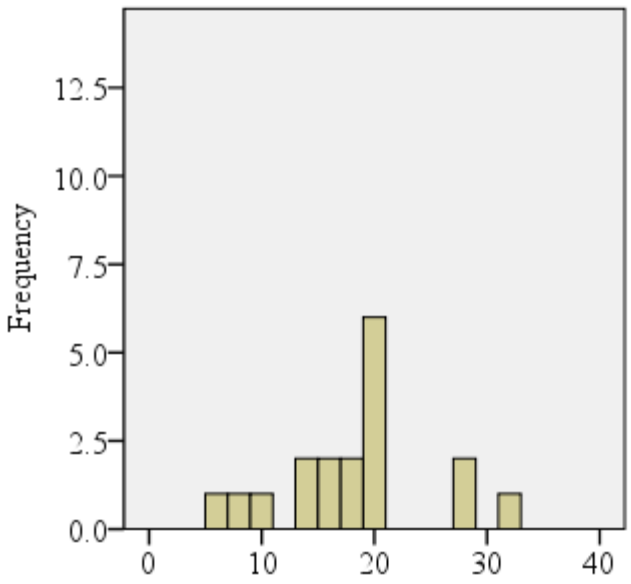

Figure 26. Psychology HRSD scores.

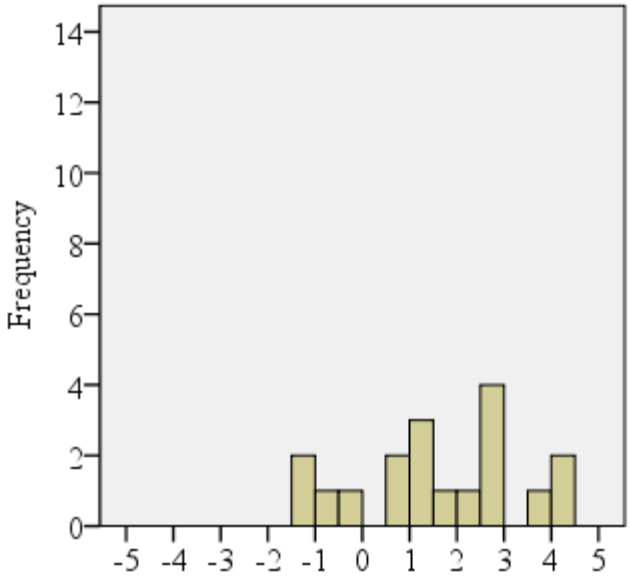

Figure 27. Psychology Composite Depression.

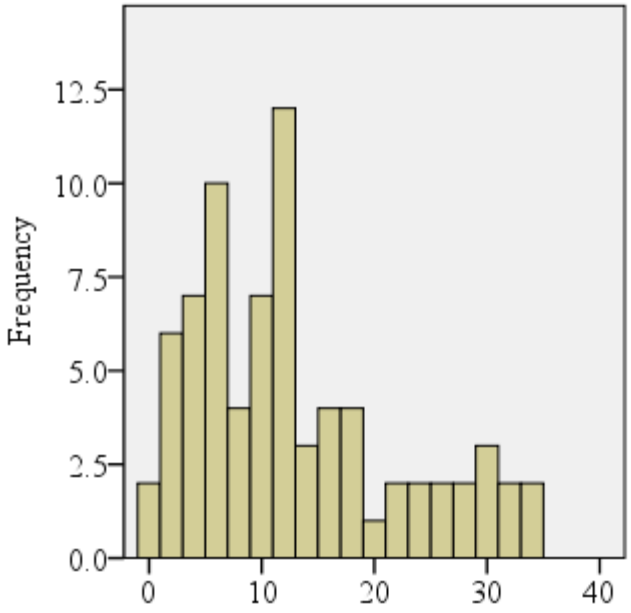

Figure 28. Aggregate BDI-II scores.

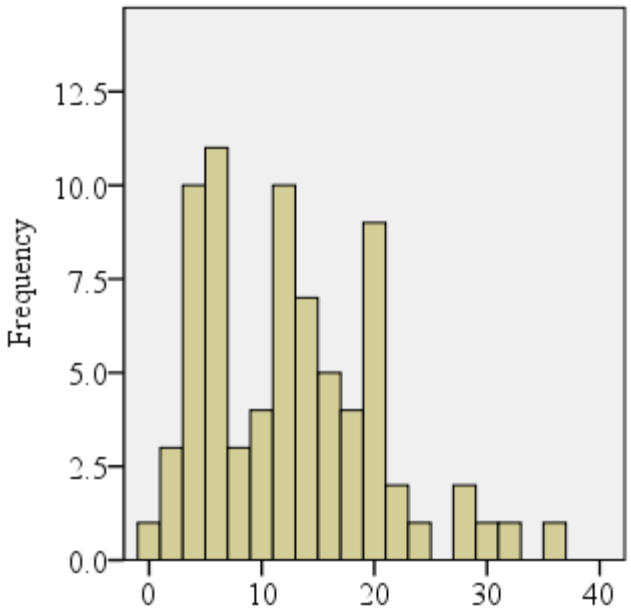

Figure 29. Aggregate HRSD scores.

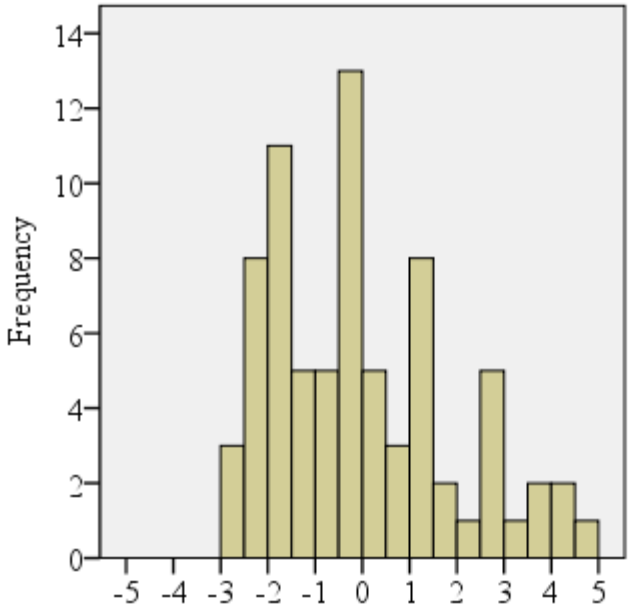

Figure 30. Aggregate Composite Depression.

Testing Participant Pool, no correlations were found between siCAMT scores and BDI-II scores ($r(17) = -0.20$, $p = 0.44$), HRSD scores ($r(17) = 0.17$, $p = 0.503$), or composite depression scores ($r(17) = -0.03$, $p = 0.90$).

Thus, two of these nine post hoc analyses yielded correlations that are significant at an uncorrected α of 0.05. However, because such repeated analyses inflate the probability of a Type 1 error, it is appropriate to apply a Bonferonni correction: $\alpha = 0.05/n = 0.05/9 = 0.006$. Utilizing this Bonferonni corrected α, none of the nine post hoc analyses yields a significant correlation. This suggests that combining the scores of participants recruited from three different sources did not cause the null result.

As illustrated by the histogram attached as Figure 6, the siCAMT scores collected in this study have a negative skew; the nonnormality of these data is confirmed by the Shapiro-Wilk test of normality: $w(75) = 0.93$; $p < 0.05$. Likewise, as illustrated by the histogram attached as Figure 30, the composite depression variable has a positive skew; the nonnormality of these data is confirmed by the Shapiro-Wilk test: $w(75) = 0.95$; $p < 0.05$. To test the possibility that the null result in connection with the first research hypothesis resulted from this nonnormality in the data distributions, the data were transformed to approximate normality and the correlation was recalculated.

Because the siCAMT scores were negatively skewed, they were first reflected by multiplying by -1, and 2 was added to each score so that all scores were 1.0 or greater. No transformation of these data was able to achieve normality, but the inverse-square transformation yielded the distribution that was closest to normal ($w(75) = 0.96$, $p = 0.01$), and was therefore used for post hoc analysis. A histogram illustrating the inverse-square-transformed siCAMT scores is included as Figure 31.

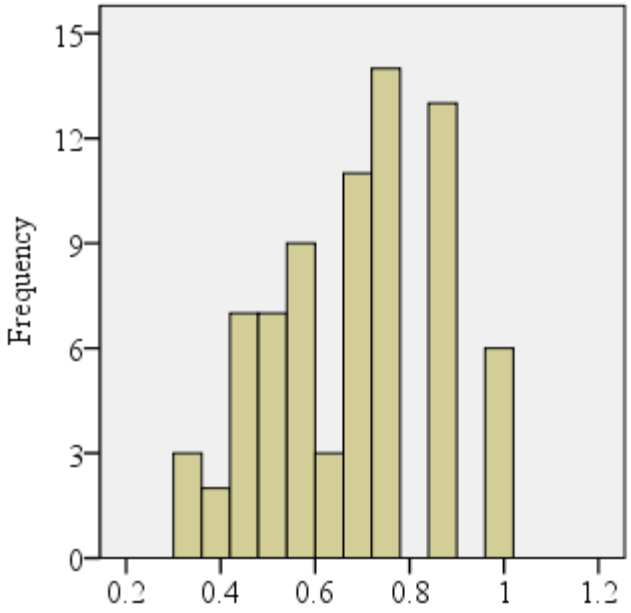

Figure 31. Inverse-square siCAMT.

Because composite depression scores were positively skewed, they were not reflected. But because the scores ranged from -2.94 to 4.90, 4 was added to each score so that all scores were 1.0 or greater. The square root transformation of these data was normally distributed ($w(75) = 0.98$, $p > 0.05$), and was therefore used for post hoc analysis. A histogram illustrating the square root transformed composite depression scores is included as Figure 32.

The inverse-square transformed siCAMT scores did not correlate with the square-root transformed composite depressions scores ($r(74) = 0.10$, $p = 0.40$). This suggests that the nonnormal distributions of the data did not cause the null result.

To test whether the hypothesized association between siCAMT scores and depression might emerge if analysis were restricted to participants exhibiting extremes of depressive symptomatology, separate mean siCAMT scores were calculated for the 20 participants with the highest composite depression scores ($Mn = 0.76$; $SD = 0.19$) and the 20 participants with the lowest composite depression scores ($Mn = 0.74$; $SD = 0.21$). The two groups' mean siCAMT scores were not significantly different ($t(38) = -0.40$; $p > 0.05$). Thus, limiting the analysis to the participants manifesting the extremes of depressive symptomatology does not alter the null result.

Given the foregoing analyses, it appears that in the data collected in this study, there was no association between siCAMT scores and depressive symptomatology as measured by BDI-II scores and HRSD scores.

Hypothesis 2

The second research hypothesis was that depression would correlate positively with overgenerality of responses to the miCAMT. Contrary to that hypothesis,

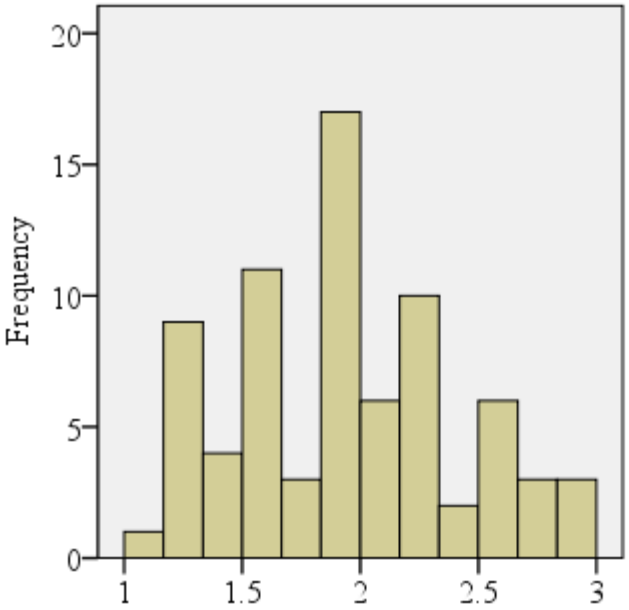

Figure 32. Square Root Composite Depression.

depression, operationalized as the sum of each participant's *z*-scores on the BDI-II and HRSD, was not found to correlate with miCAMT scores ($r(74) = -0.05$, $p = 0.66$). Post-hoc analyses were conducted to test whether this null result might be an artifact of the research design or of the form of the data collected.

To test whether the null result might have been caused by forming a composite depression variable from BDI-II and HRSD scores, separate correlations were calculated between miCAMT scores and BDI-II scores, and between miCAMT scores and HRSD scores. Neither BDI-II scores ($r(74) = -0.06$, $p = 0.63$) nor HRSD scores ($r(74) = -0.04$, $p = 0.71$) were found to correlate with miCAMT scores. This suggests that deriving a composite depression score comprising BDI-II scores and HRSD scores did not cause the null result with respect to the second research hypothesis.

To test whether the null result might have been caused by recruiting participants from three different populations, separate correlations were calculated for participants recruited from each source. Histograms summarizing the BDI-II, HRSD, and composite depression scores for participants recruited from each of the sources are included as Figures 19 –27.

For participants recruited from the Educational Psychology Participant Pool, no correlation was found between miCAMT scores and BDI-II scores ($r(41) = -0.09$, $p = 0.57$), HRSD scores ($r(41) = -0.09$, $p = 0.58$), or composite depression scores ($r(41) = -0.09$, $p = 0.56$). For participants recruited from the University Counseling Center, no correlation was found between miCAMT scores and either HRSD scores ($r(14) = 0.36$, $p = 0.18$) or composite depression scores ($r(14) = 0.49$, $p = 0.06$); however, miCAMT scores did correlate with BDI-II scores ($r(14) = 0.57$, $p = 0.03$). For participants recruited

from the Psychology Mass-Testing Participant Pool, no correlations were found between miCAMT scores and BDI-II scores ($r(17) = -0.16$, $p = 0.53$), HRSD scores ($r(17) = -0.09$, $p = 0.73$), or composite depression scores ($r(17) = -0.14$, $p = 0.59$).

Thus, one of these nine post hoc analyses yielded a correlation that is significant at an uncorrected α of 0.05. However, utilizing the Bonferonni corrected $\alpha = 0.05/n = 0.05/9 = 0.006$, none of the nine post hoc analyses yields a significant correlation. This suggests that combining the scores of participants recruited from three different sources did not cause the null result.

As illustrated by the histogram attached as Figure 5, the miCAMT scores collected in this study have a positive skew; the nonnormality of these data is confirmed by the Shapiro-Wilk test of normality: $w(75) = 0.92$; $p < 0.05$. Because the scores ranged from 0.0 to 0.75, 1 was added to each score so that all of the scores were 1.0 or greater. The inverse square transformation of these data was normally distributed ($w(75) = 0.97$, $p > 0.05$), and was used for post hoc analysis. A histogram illustrating the distribution of the inverse-square-transformed miCAMT scores is included as Figure 33.

As illustrated in the histogram attached as Figure 32, the square-root transformation of the composite depression scores is normally distributed, and was therefore used for post hoc analysis.

The inverse-square transformed miCAMT scores did not correlate with the square-root transformed composite depression scores ($r(74) = 0.04$, $p = 0.74$). This suggests that the nonnormal distributions of the data did not cause the null result with respect to the second research hypothesis.

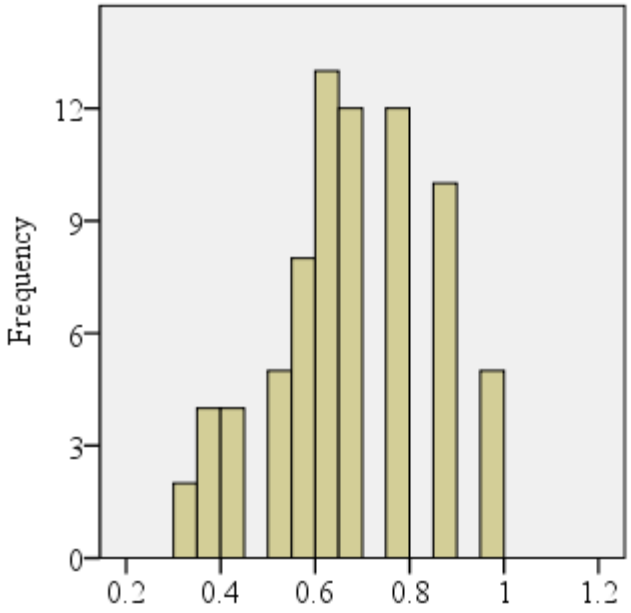

Figure 33. Inverse-square miCAMT.

To test whether the hypothesized association between miCAMT scores and depression might emerge if analysis were restricted to participants exhibiting extremes of depressive symptomatology, separate mean miCAMT scores were calculated for the 20 participants with the highest composite depression scores (*Mn* = 0.24; *SD* = 0.18) and the 20 participants with the lowest composite depression scores (*Mn* = 0.31; *SD* = 0.23). The two groups' mean miCAMT scores were not significantly different ($t(38) = 1.05$; $p > 0.05$). Thus, limiting the analysis to the participants manifesting the extremes of depressive symptomatology does not alter the null result.

Given the foregoing analyses, it appears that in the data collected in this study, there was no association between miCAMT scores and depressive symptomatology as measured by BDI-II scores and HRSD scores.

Hypothesis 3

The third research hypothesis was that scores on the siCAMT would correlate both with depressive rumination and with executive dysfunction. Contrary to this hypothesis, siCAMT scores were not found to correlate with either depressive rumination, operationalized as the sum of each participant's *z*-scores on the RSS and RRS, ($r(74) = 0.06$, $p = 0.59$) or with any of the measures of impairment of executive capacity – the Visual Search Task ($r(74) = 0.03$, $p = 0.78$), the Inhibition Condition of the D-KEFS Color-Word Interference Test ($r(74) = -0.13$, $p = 0.27$), the Inhibition/Switching Condition of the D-KEFS Color-Word Interference Test ($r(74) = -0.12$, $p = 0.30$), or the AOSPAN ($r(74) = 0.15$, $p = 0.19$). Post hoc analyses were conducted to test whether these null results might be artifacts of the research design or of the form of the data collected.

To test whether the null result might have been caused by forming a composite depressive rumination variable from RSS and RRS scores, separate correlations were calculated between siCAMT scores and RSS scores, and between siCAMT scores and RRS scores. Neither RSS scores ($r(74) = 0.10$, $p = 0.39$) nor RRS scores ($r(74) = 0.02$, $p = 0.86$) were found to correlate with siCAMT scores. This suggests that deriving a composite depressive rumination score comprising RSS and RRS scores did not cause the null result with respect to the third research hypothesis.

To test whether the null result might have been caused by the failure to form a composite executive dysfunction variable, a composite variable was formed by calculating and summing *z*-scores for each of the individual measures of executive dysfunction – the Visual Search Task, Inhibition Condition of the D-KEFS Color-Word Interference Test, Inhibition/Switching Condition of the D-KEFS Color-Word Interference Test, and OSPAN. A histogram summarizing the distribution of this composite executive dysfunction measure is included as Figure 34.

The composite executive dysfunction scores did not correlate with siCAMT scores ($r(74) = -0.15$, $p = 0.21$). This suggests that the failure to calculate a composite executive dysfunction measure, and instead testing the associations between siCAMT scores and scores on the four individual measures of executive dysfunction did not cause the null result with respect to the third research hypothesis.

To test whether the null result with respect to the third research hypothesis might have been caused by recruiting participants from three different populations, separate correlation analyses were performed for participants from each recruitment source. Histograms summarizing the scores on the individual executive dysfunction measures

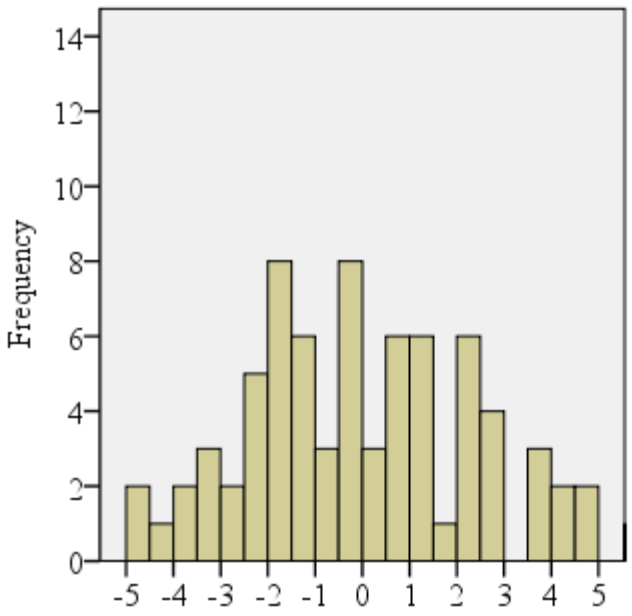

Figure 34. Composite Executive Dysfunction.

and the composite executive dysfunction score for participants recruited from each of these sources are included as Figures 35 - 49.

Correlations between siCAMT scores and scores on each of the four individual measures of executive dysfunction together with the composite executive dysfunction scores were calculated separately for participants recruited from each of the three sources. For participants recruited from the Educational Psychology Participant Pool, no correlation was found between siCAMT scores and scores on the Visual Search Task ($r(41) = -0.13$, $p = 0.43$), the Inhibition Condition of the D-KEFS Color-Word Interference Test ($r(41) = -0.10$, $p = 0.55$), the Inhibition/Switching Condition of the D-KEFS Color-Word Interference Test ($r(41) = -0.22$, $p = 0.17$), the OSPAN ($r(41) = 0.15$, $p = 0.36$), or the composite executive dysfunction scores ($r(41) = -0.23$, $p = 0.14$). For participants recruited from the University of Utah Counseling Center, no correlation was found between siCAMT scores and scores on the Visual Search Task ($r(14) = 0.15$, $p = 0.59$), the Inhibition Condition of the D-KEFS Color-Word Interference Test ($r(14) = -0.15$, $p = 0.58$), the Inhibition/Switching Condition of the D-KEFS Color-Word Interference Test ($r(14) = 0.04$, $p = 0.88$), the OSPAN ($r(14) = 0.37$, $p = 0.20$), or the composite executive dysfunction scores ($r(14) = -0.06$, $p = 0.83$). Finally, for participants recruited from the Psychology Mass-testing Participant Pool, no correlation was found between siCAMT scores and scores on the Visual Search Task ($r(17) = 0.31$, $p = 0.21$), the Inhibition Condition of the D-KEFS Color-Word Interference Test ($r(17) = -0.16$, $p = 0.52$), the Inhibition/Switching Condition of the D-KEFS Color-Word Interference Test ($r(17) = -0.12$, $p = 0.65$), the OSPAN ($r(17) = 0.09$, $p = 0.71$), or the composite executive dysfunction scores ($r(18) = -0.07$, $p = 0.79$). This post hoc analysis

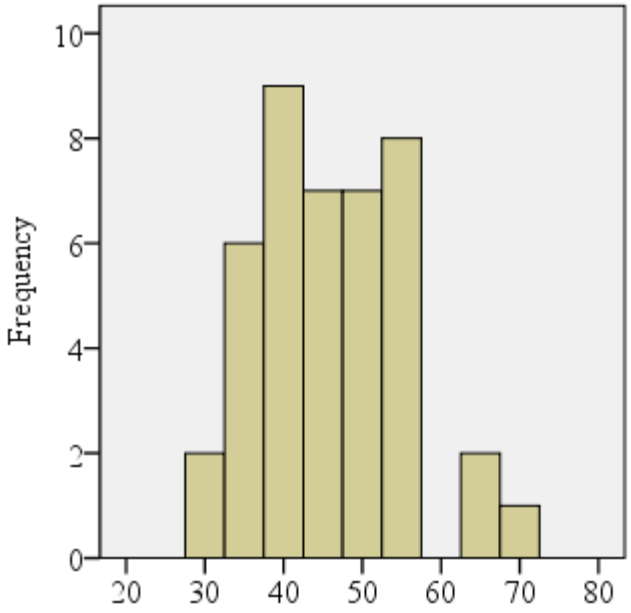

Figure 35. EdPs Stroop Inhibition (sec.).

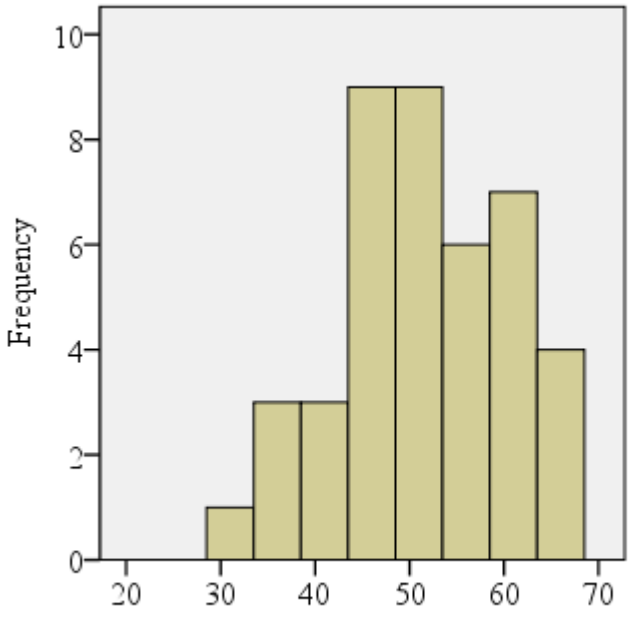

Figure 36. EdPs Stroop Inhibition/Switching (sec.).

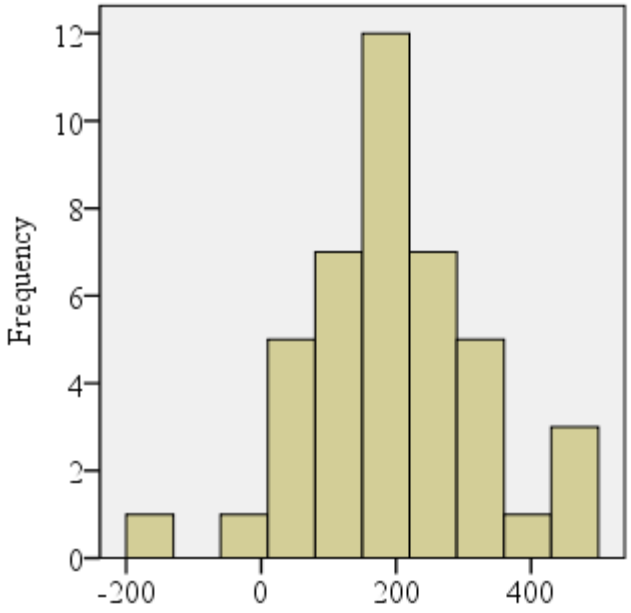

Figure 37. EdPs Effort – Auto (ms.).

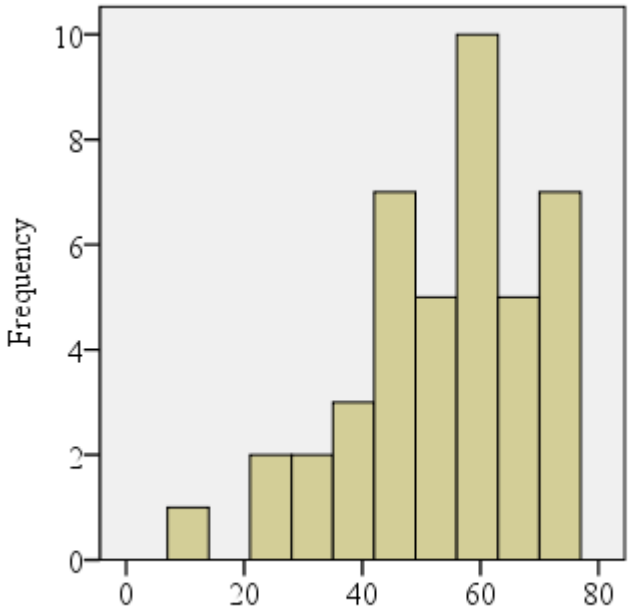

Figure 38. EdPs OSPAN Total.

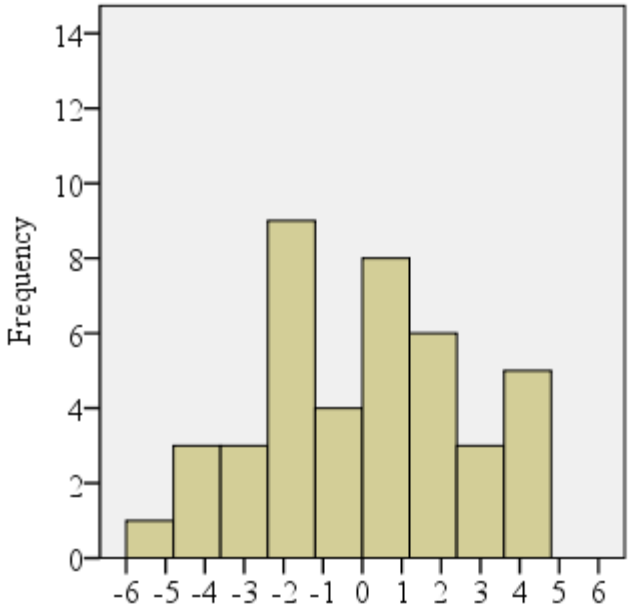

Figure 39. EdPs Composite Executive Dysfunction.

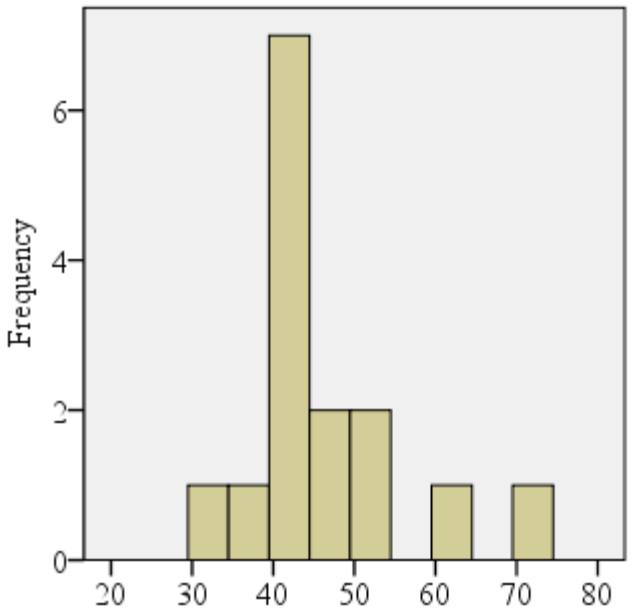

Figure 40. UCC Stroop Inhibition (sec.).

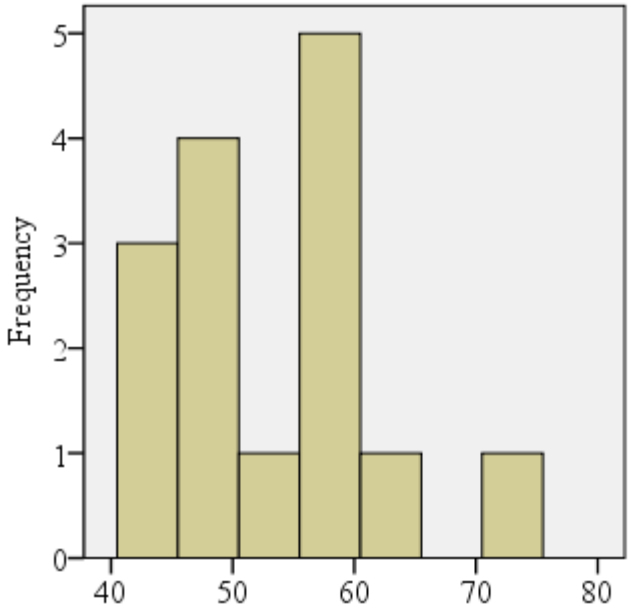

Figure 41. UCC Stroop Inhibition/Switching (sec.).

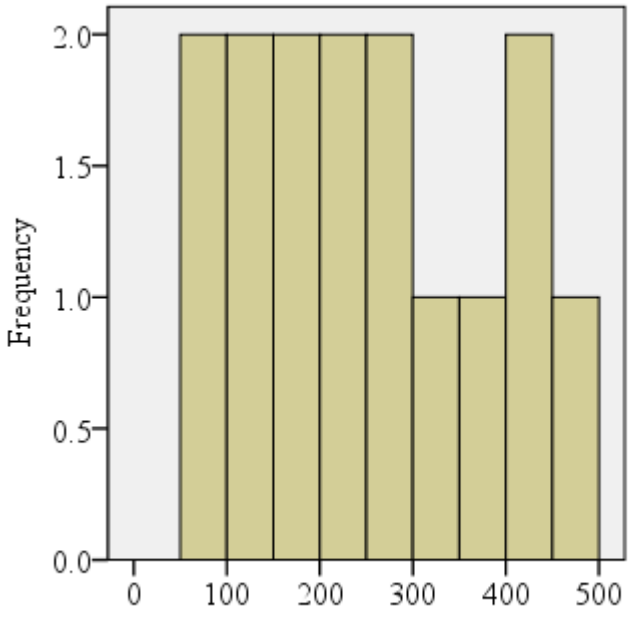

Figure 42. UCC Effort – Auto (ms.).

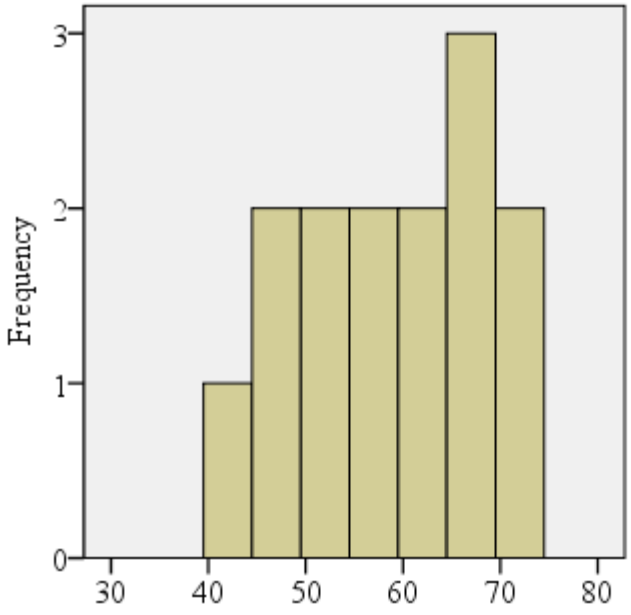

Figure 43. UCC OSPAN Total.

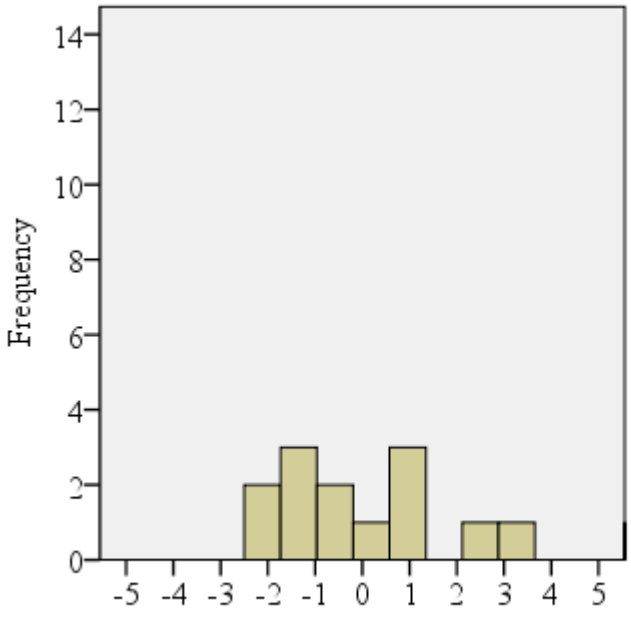

Figure 44. UCC Composite Executive Dysfunction.

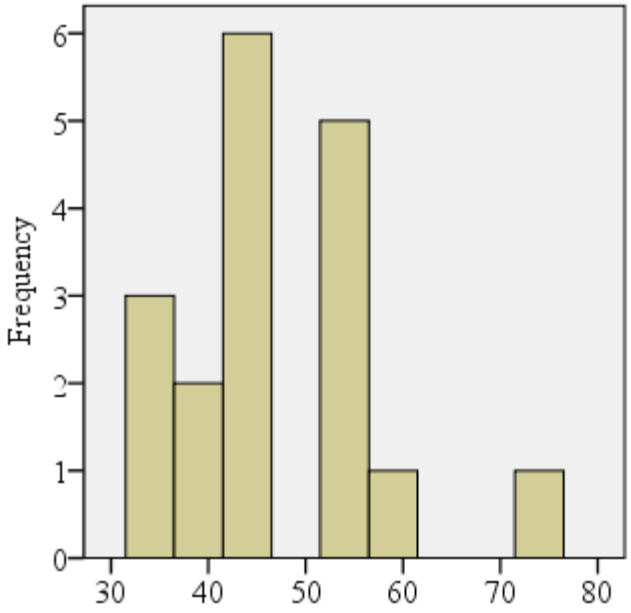

Figure 45. Psychology Stroop Inhibition (sec.).

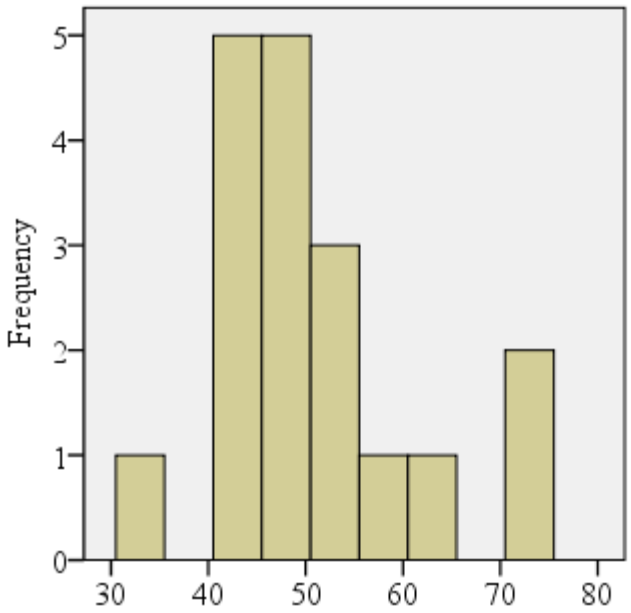

Figure 46. Psychology Stroop Inhibition/Switching (sec.).

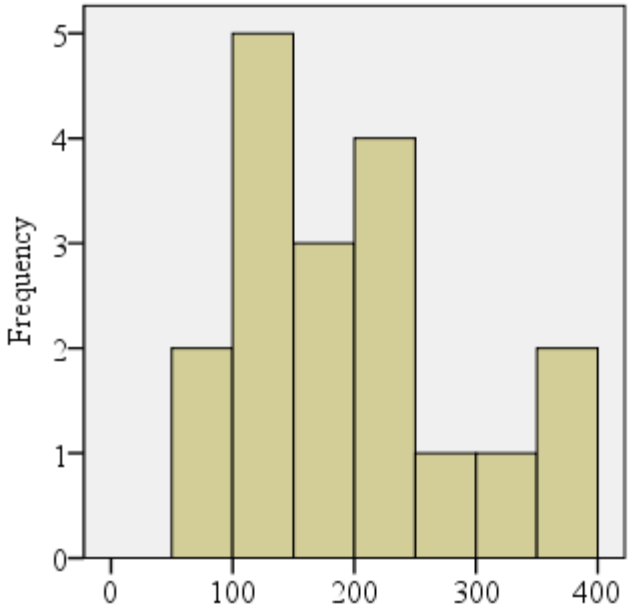

Figure 47. Psychology Effort – Auto (ms.).

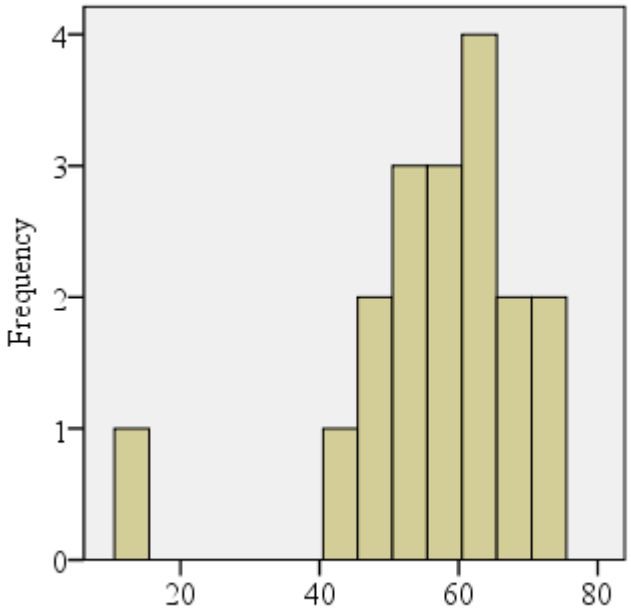

Figure 48. Psychology OSPAN Total.

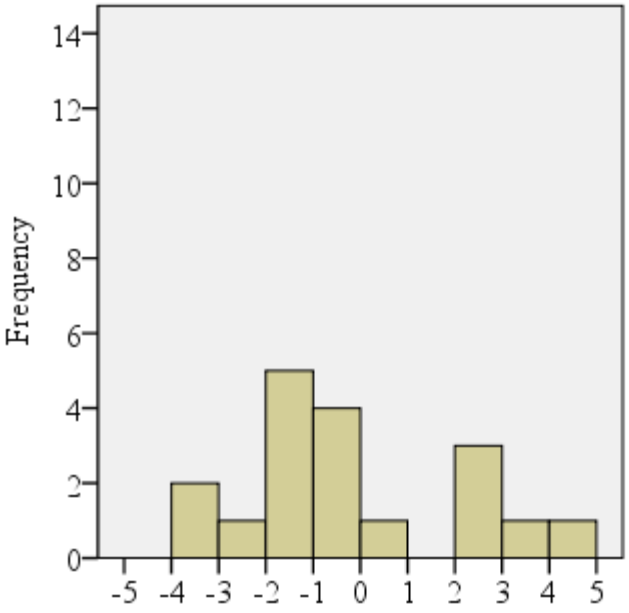

Figure 49. Psychology Composite Executive Dysfunction.

suggests that the failure to find any association between scores on the siCAMT and the measures of executive dysfunction in this study did not result from the recruitment of participants from three different sources.

Histograms summarizing the scores on the two individual measures of depressive rumination and the composite depressive rumination scores for participants recruited from each of the three sources are included as Figures 50 - 58. Correlations between siCAMT scores and each of these three depressive rumination scores were calculated separately for participants recruited from each of the three sources. For participants recruited from the Educational Psychology Participant Pool, no correlation was found between siCAMT scores and scores on the RRS ($r(41) = 0.12$, $p = 0.46$), the RSS ($r(41) = 0.20$, $p = 0.21$), or the composite depressive rumination scores ($r(41) = 0.17$, $p = 0.29$). For participants recruited from the University of Utah Counseling Center, no correlation was found between siCAMT scores and scores on the RRS ($r(14) = 0.38$, $p = 0.16$), the RSS ($r(14) = 0.31$, $p = 0.26$), or the composite depressive rumination scores ($r(14) = 0.36$, $p = 0.19$). Finally, for participants recruited from the Psychology Mass-testing Participant Pool, no correlation was found between siCAMT scores and scores on the RRS ($r(17) = -0.20$, $p = 0.42$), the RSS ($r(17) = -0.04$, $p = 0.88$), or the composite depressive rumination scores ($r(18) = -0.13$, $p = 0.61$). These results suggest that the failure to find any association between scores on the siCAMT and the measures of depressive rumination in this study did not result from the recruitment of participants from three different sources.

As illustrated by the histogram attached as Figure 6, the siCAMT scores have a negative skew, but the distribution yielded by the inverse-square transformation of these

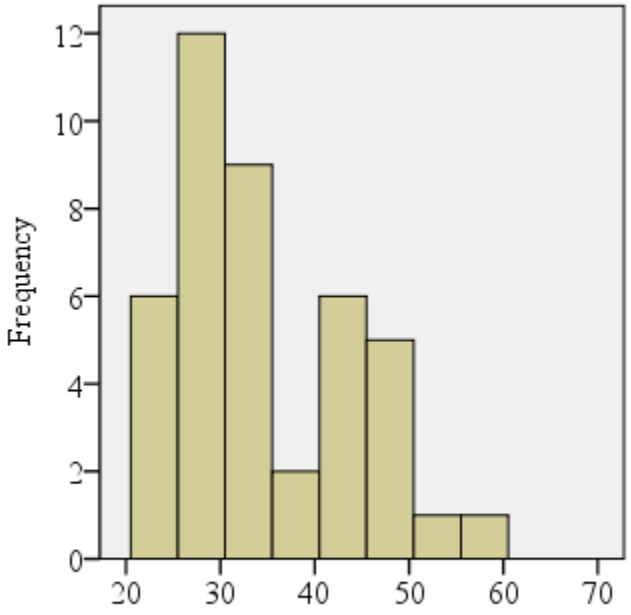

Figure 50. EdPs RRS scores.

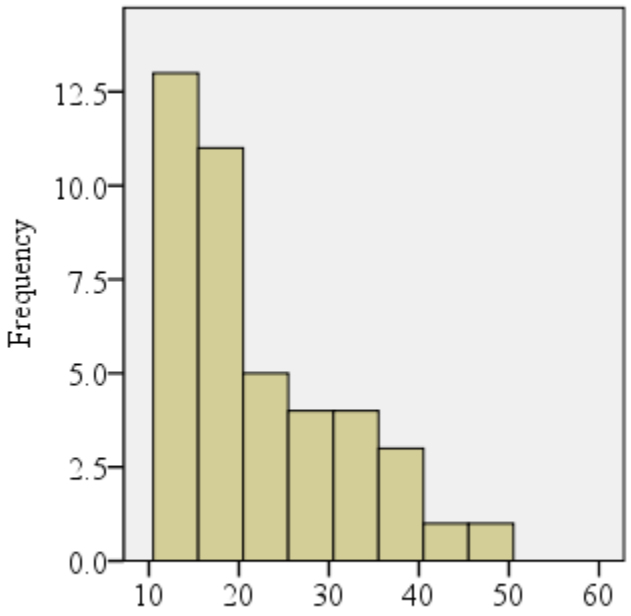

Figure 51. EdPs RSS scores.

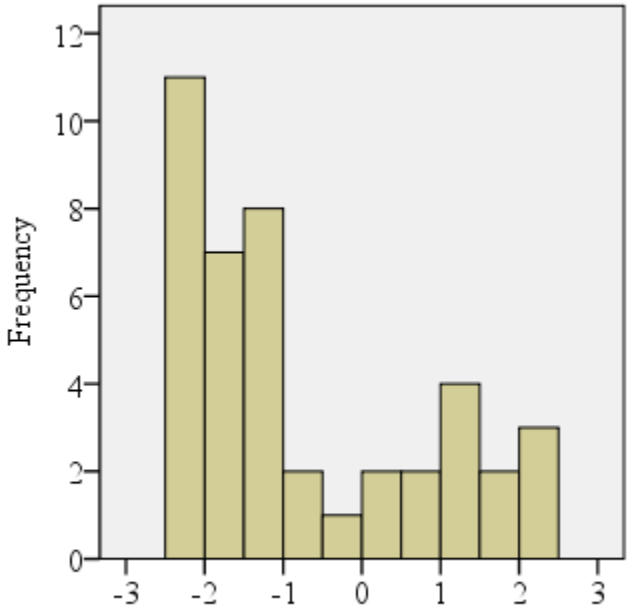

Figure 52. EdPs Composite Depressive Rumination.

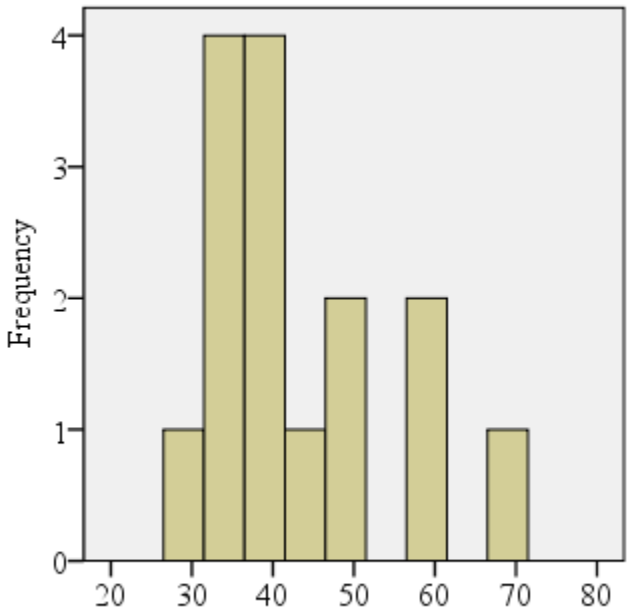

Figure 53. UCC RRS scores.

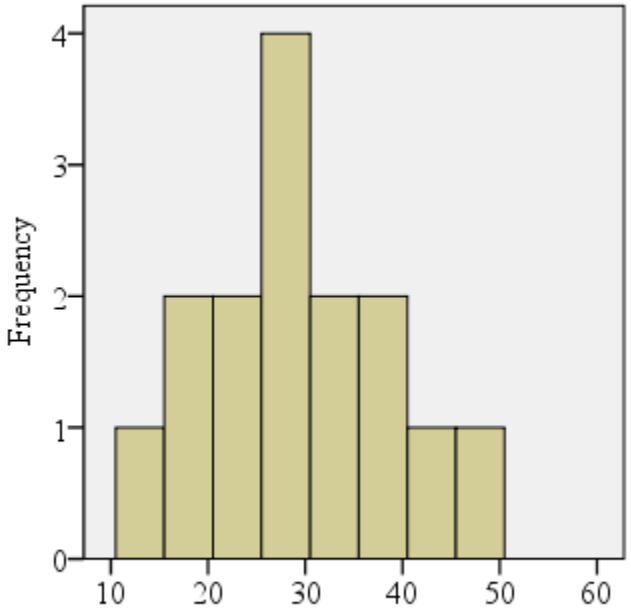

Figure 54. UCC RSS scores.

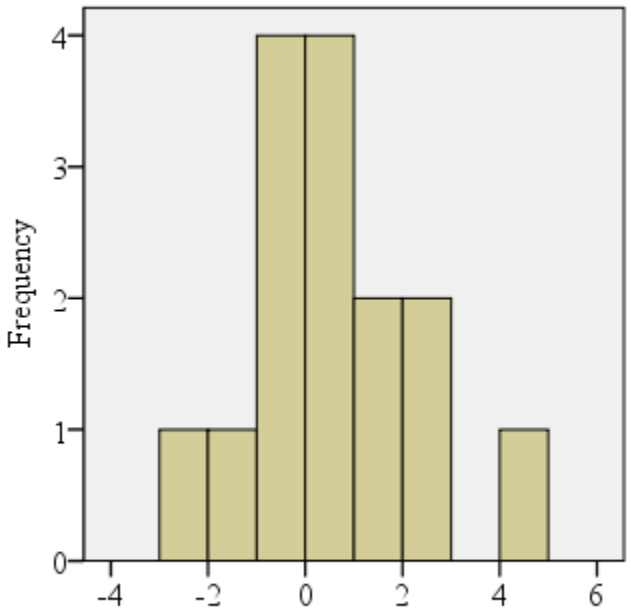

Figure 55. UCC Composite Depressive Rumination.

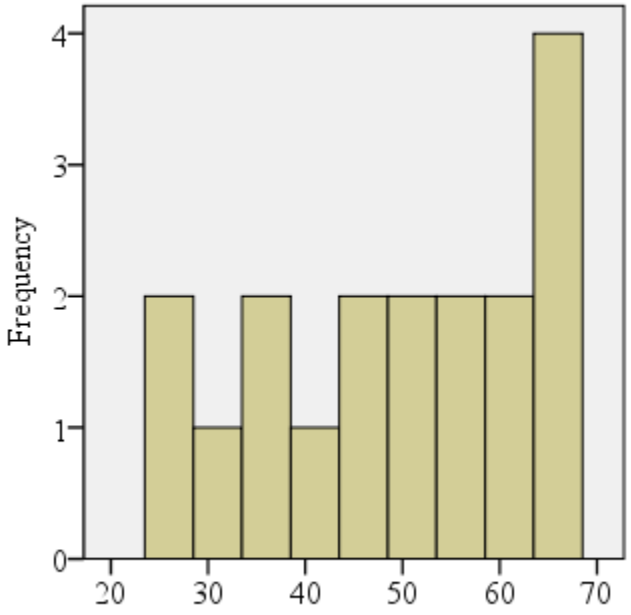

Figure 56. Psychology RRS scores.

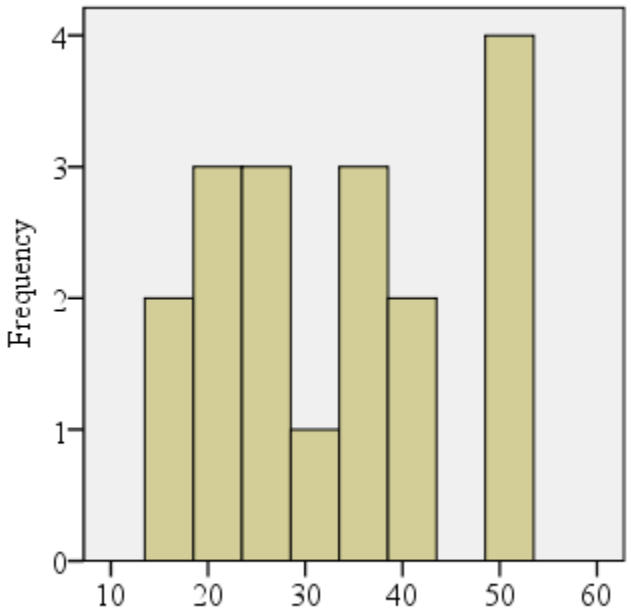

Figure 57. Psychology RSS scores.

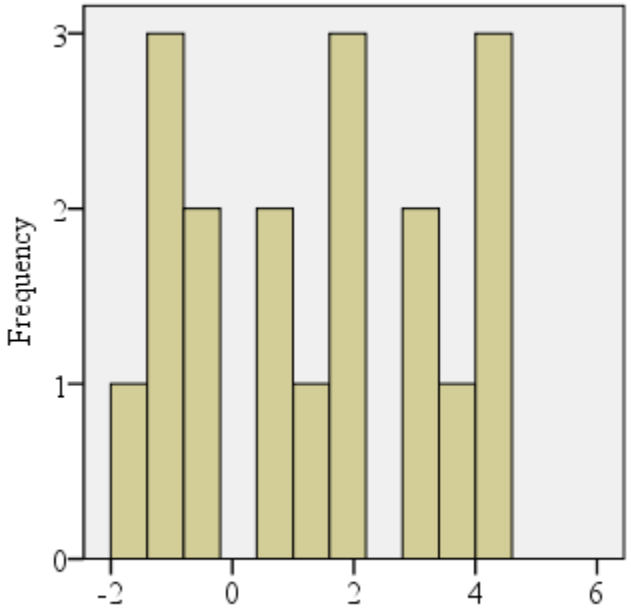

Figure 58. Psychology Composite Depressive Rumination.

data (summarized in the histogram attached as Figure 31) approaches normality. That transformation of the siCAMT scores was used for post hoc analysis regarding the third research hypothesis.

As illustrated by the histogram attached as Figure 18, the composite depressive rumination scores collected in this study have a positive skew; the nonnormality of these data is confirmed by the Shapiro-Wilk test of normality: $w(74) = 0.92$; $p < 0.05$. Because the composite depressive rumination scores range from -2.48 to 4.26, 4 was added to each score so that all of the scores were greater than 1.0. No transformation of these data was able to achieve normality, but the Log10 transformation yielded the distribution that was closest to normal ($w(75) = 0.953$, $p = 0.008$), and was therefore used for post hoc analysis. A histogram illustrating the Log10-transformed composite depressive rumination scores is included as Figure 59.

The composite executive dysfunction scores, summarized in Figure 35, were normally distributed ($w(74) = 0.987$, $p > 0.05$).

The inverse-square siCAMT scores did not correlate with either the composite executive dysfunction scores ($r(73) = -0.15$, $p = 0.21$), or the LOG10 transformed composite depressive rumination scores ($r(74) = 0.08$, $p = 0.48$). This suggests that the null result for the third research hypothesis did not result from the nonnormal distributions of the data.

Given the foregoing analyses, it appears that in the data collected in this study, there was no association between siCAMT scores and either depressive rumination as measured by the RSS or RRS, or executive dysfunction as measured by the Visual Search

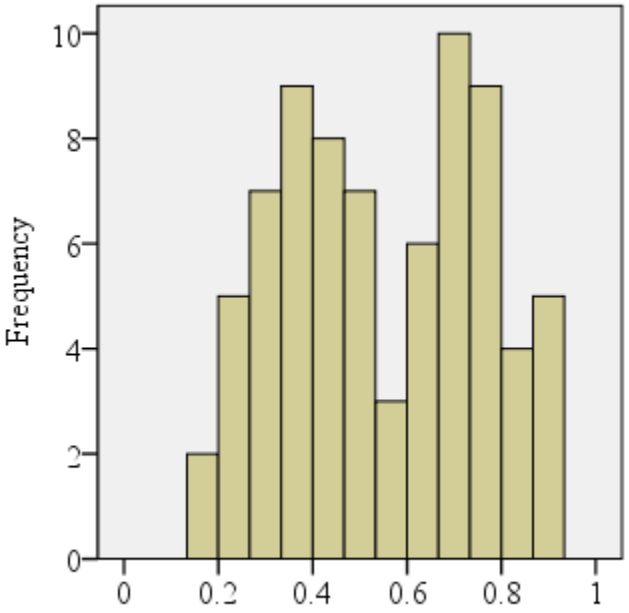

Figure 59. Log10 Composite Depressive Rumination.

Task, the Inhibition Condition or the Inhibition/Switching Condition of the D-KEFS Color-Word Interference Test, or the OSPAN.

Hypothesis 4

The fourth research hypothesis was that scores on the miCAMT would correlate with depressive rumination but not with executive dysfunction. Contrary to this hypothesis, depressive rumination operationalized as the sum of each participant's *z*-scores on the RSS and RRS was not found to correlate with miCAMT scores ($r(74) = -0.14, p = 0.22$). Post hoc analyses were conducted to test whether this null result might be an artifact of the research design or of the form of the data collected.

To test whether the null result might have been caused by forming a composite depressive rumination variable from RRS and RSS scores, separate correlations were calculated between miCAMT scores and RRS scores, and between miCAMT scores and RSS scores. Neither RRS scores ($r(74) = -0.18$, $p = 0.11$) nor RSS scores ($r(74) = -0.09$, $p = 0.44$) were found to correlate with miCAMT scores. This suggests that deriving a composite depressive rumination score comprising RRS and RSS scores did not cause the null result with respect to the fourth research hypothesis.

To test whether the null result with respect to the fourth research hypothesis might have been caused by recruiting participants from three different populations, separate analyses were conducted for participants from each recruitment source. Histograms summarizing the RRS, RSS, and composite depressive rumination scores for participants recruited from each of these sources are included as Figures 50-58.

Correlations between miCAMT scores and each of these three depressive rumination scores were calculated separately for participants recruited from each of the

three sources. For participants recruited from the Educational Psychology Participant Pool, no correlation was found between miCAMT scores and scores on the RRS ($r(41) = 0.08$, $p = 0.60$), scores on the RSS ($r(41) = 0.14$, $p = 0.39$), or the composite depressive rumination scores ($r(41) = 0.12$, $p = 0.46$). For participants recruited from the University of Utah Counseling Center, no correlation was found between miCAMT scores and scores on the RRS ($r(14) = -0.33$, $p = 0.24$), scores on the RSS ($r(14) = -0.07$, $p = 0.81$), or the composite depressive rumination scores ($r(14) = -0.21$, $p = 0.46$). Finally, however, for participants recruited from the Psychology Mass-testing Participant Pool, significant correlations were found between miCAMT scores and scores on the RRS ($r(17) = -0.53$, $p = 0.02$), scores on the RSS ($r(17) = -0.50$, $p = 0.03$), and the composite depressive rumination scores ($r(18) = -0.55$, $p = 0.02$).

Thus, three of these nine post hoc analyses yielded correlations that are significant at an uncorrected α of 0.05. However, utilizing the Bonferonni corrected $\alpha = 0.05/n = 0.05/9 = 0.006$, none of the nine post hoc analyses yields a significant correlation. This suggests that the failure to find any association between scores on the miCAMT and the measures of depressive rumination in this study did not result from the recruitment of participants from three different sources.

As illustrated by the histogram attached as Figure 5, the miCAMT scores collected in this study have a positive skew. The inverse square transformation of these data, summarized in the histogram attached as Figure 33, was normally distributed ($w(75) = 0.97$, $p > 0.05$), and was used for post hoc analysis.

As illustrated by the histogram attached as Figure 18, the composite depressive rumination scores collected in this study have a positive skew. Although no

transformation of these data succeeded in producing a normal distribution, the Log10 transformation yielded the distribution that was closest to normal ($w(75) = 0.953$, $p = 0.008$) (summarized in the histogram attached as Figure 59), and was therefore used for post hoc analysis.

The inverse-square transformed miCAMT scores did not correlated with the Log10 transformed composite depressive rumination scores ($r(74) = 0.08$, $p = 0.51$). This suggests that the null result with respect to the fourth research hypothesis was not caused by the nonnormality of the data.

Given the foregoing analyses, it appears that in the data collected in this study, there was no association between miCAMT scores and depressive rumination as measured by the RSS and RRS.

Hypothesis 5

The fifth research hypothesis was that the correlation between scores on the miCAMT and depressive rumination would be greater than the correlation between scores on the siCAMT and depressive rumination. Given the failure to find any such correlations and the discussion of these null results discussed above, no further discussion is required regarding the fifth research hypothesis.

CHAPTER IV

DISCUSSION

In the 24 years since Williams and Broadbent (1986) first described the AMT, a substantial body of research has replicated the basic finding that a tendency to report overgeneral autobiographical memories in response to the AMT correlates with depression (e.g., van Vreeswijk & de Wilde, 2004). It remains unclear, however, what this tendency to make overgeneral AMT responses actually signifies. The purpose of this dissertation research project was to test whether this tendency might be driven by two separate processes, each of which has been suggested in the literature: (1) the propensity of depressed persons to remember their lives in overgeneral rather than specific terms (defined herein as autobiographical overgenerality); and (2) the predisposition of depressed persons to neglect an instruction such as the AMT's instruction that they should report only specific memories (defined herein as instruction neglect).

Two computerized versions of the AMT were employed – a standard-instruction version in which participants were instructed to retrieve only specific autobiographical memories (defined above as the siCAMT), and a minimal-instruction version in which participants were asked to retrieve autobiographical memories, but were given no instruction regarding the specificity or generality of those memories (defined above as the miCAMT). It was predicted that the overgenerality of participants' responses to the siCAMT would reflect both autobiographical overgenerality and instruction neglect.

That is, a participant might report overgeneral memories in response to the siCAMT for either or both of two different reasons – he has a preponderance of overgeneral rather than specific autobiographical memories and/or he tends to neglect the specificity instruction and report whatever memory comes first to mind, be it overgeneral or specific. By contrast, it was predicted that the overgenerality of participants' responses to the miCAMT would reflect only autobiographical overgenerality. That is, because the miCAMT lacked any specificity instruction, a participant's tendency to neglect such instructions could have no effect; rather, a participant's tendency to report overgeneral memories in response to the unconstrained miCAMT would reflect only the characteristic overgenerality of her autobiographical memories.

The first and second research hypotheses were, respectively, that depression would correlate with scores on the siCAMT and scores on the miCAMT. These hypothesized correlations would have simply replicated previously reported results.

The third research hypothesis was that scores on the siCAMT would correlate both with depressive rumination and with executive dysfunction. Depressive rumination is presumed to be one of the processes underlying autobiographical overgenerality. Likewise, executive dysfunction is presumed to be one of the processes underlying instruction neglect. The hypothesized correlations would therefore have supported an inference that both autobiographical overgenerality and instruction neglect had effects upon siCAMT scores.

The fourth research hypothesis was that scores on the miCAMT would correlate with depressive rumination, but not with executive dysfunction. This hypothesized

pattern would support an inference that autobiographical overgenerality had an effect upon siCAMT scores, but that instruction neglect had no such effect.

Finally, the fifth research hypothesis was that depressive rumination would correlate more strongly with miCAMT than with siCAMT scores. This hypothesized pattern would support an inference that miCAMT scores were a relatively pure measure of autobiographical overgenerality, while siCAMT scores confounded autobiographical overgenerality and instruction neglect.

None of these hypotheses was supported by the data collected in this study. Depression correlated neither with scores on the siCAMT nor with scores on the miCAMT. Nor did depressive rumination or executive dysfunction correlate with scores on either the siCAMT or the miCAMT. The possible explanations and implications of these null results are discussed below.

Null result regarding hypothesis 1

The failure to detect any correlation between depression and siCAMT scores was not only contrary to the first research hypothesis, but was also unexpected and contrary to a significant body of published research.[9] This is, however, the principal investigator's second null result in this area of research: In a thesis research project that utilized a CAMT that was essentially identical to the siCAMT, no correlation between depression

[9] Among the 15 participants recruited from the University Counseling Center, and utilizing uncorrected α's, siCAMT scores were found to correlate with HRSD scores and composite depression scores. These 15 participants were "clinical" in that they had all sought mental health services; in this respect they differed from the participants recruited from the two departmental participant pools. As discussed above, the association between depression and over-general AMT responses is reportedly robust in clinical populations, but is less so in nonclinical populations. It is tempting to speculate that the over-generality of AMT responses is associated not with a respondent's depression per se, but with the participant's clinical status, i.e., having sought clinic treatment for one's depressive symptomatology. However, given the small number of participants recruited from the University Counseling Center, and given the inflation of Type 1 error from repeated analyses, that temptation is best resisted.

and overgenerality of CAMT responses was detected (McCowin, 2007). The null result in that thesis research project was tentatively imputed to several possible problems that were remedied in the current research project.

Aspects of this study that should have enhanced its capacity to to detect the hypothesized correlation

A first apparent problem with the design of the principal investigator's thesis research study was the instrument that was employed to measure the degree of depressive symptomatology – the Zung Self-rating Depression Scale (Zung), an instrument whose reliability has been questioned (Gotlib & Cane, 1989). It was possible that the unreliability with which this instrument measured depression introduced error sufficient to preclude a statistically significant correlation between depression and CAMT scores. In the current project, in order to ensure a more reliable measure of depression, both the BDI-II and the HRSD were administered. Each of these measures of depressive symptomatology has been frequently utilized in AMT research (e.g., Debeer et al., 2009; Raes, Hermans, Williams, Beyers et al., 2006; Raes et al., 2005; Raes, Hermans, Williams, Demyttenaere et al., 2006; Raes et al., 2007). The scores from these two instruments were combined to derive the depression variable. It was hoped that this procedure would yield a more reliable and valid measure of depression, and thereby facilitate the detection of the predicted correlation with siCAMT scores.

A second apparent problem with the principal investigator's thesis study was the restriction of the range of depressive symptomatology among the research participants. All of the Zung scores of the research participants in the thesis project fell within the nondepressed range. By contrast, in the present study participants with a larger range of

depressive symptomatology were recruited. Forty-nine of the 75 participants had BDI-II scores in the range suggestive of minimal depression. Ten of the participants had BDI-II scores suggesting mild depression, 9 had scores suggesting moderate depression, and 7 had scores suggesting severe depression.

A third possible problem with the principal investigator's thesis study was the use of an untried set of cue words in the CAMT, i.e., the thesis study did not use a set of cue words from one of the previous studies in which a correlation between depression and AMT scores was found. To accommodate the possibility that this correlation is specific to particular cue words, the siCAMT and miCAMT in the present study used the same cue words as were used in two previously reported studies in which the predicted correlation was detected (Burnside et al., 2004; Dalgleish et al., 2007).

Finally, the sample size in the present research project was based on an a priori power analysis. The effect sizes of -0.43 and -0.41 reported by Dalgleish et al. (2007) were taken as approximations of the effect that this study was designed to detect. Given the sample size of 75 participants in the present study, this study had a power of 0.98 to detect an expected effect size of 0.40 (Cohen, 1969, at 84, table 3.3.2).

These four modifications to the study design of the principal investigator's thesis project should have enhanced the ability of the present study to detect a correlation between depression and siCAMT scores. Given this study's power of 0.98, it is unlikely that the present null result simply reflects a type 2 error. And given the substantial body of published studies that detected a correlation between depression and AMT scores, it seems premature to assert that all of those studies reflect type 1 error. There are,

however, aspects of the present study's design that may have precluded the detection of the predicted effect.

Aspects of this study that may have precluded detection of the hypothesized correlation

The Cronbach's alpha for the siCAMT was only 0.69. It is possible that this low internal consistency reflects a relatively high level of random measurement error, and that this imprecision prevented the detection of the hypothesized correlations with siCAMT scores. However, the internal consistency of various versions of the AMT are rarely reported in the literature, and it is therefore difficult to determine whether the relatively low internal consistency of the siCAMT in this study distinguishes it from versions of the AMT used in other studies in which the hypothesized association with depressive symptomatology was reported. Only a single other study has been found in which the internal consistency of a version of the AMT was reported: Hauer, Wessel, Geraerts, Merkelbach, and Dalgleish (2008) reported that the Cronbach's alpha for the version of the AMT that they utilized was 0.64. But despite an internal consistency even lower than that of the siCAMT in the present study, Hauer et al. reported that the scores on their AMT nevertheless correlated with BDI-II scores. If the internal consistencies of AMT scores in other studies are not generally greater than the internal consistency of the siCAMT scores in this study, then this cannot account for the present null result.

The computerized AMT minimizes experimenter/expectancy effects

In almost all of the studies that have reported significant correlations between depression and AMT scores, the AMT was administered by an experimenter sitting face-

to-face with each participant. It is possible that this face-to-face format introduced an inadvertent experimenter effect or expectancy effect.

While testing participants in this research project, as well as in the principal investigator's thesis research project, this author realized that it is typically possible to form a rough impression of each participant's level of depressive symptomatology. Indeed, after observing a participant's bodily postures, vocal tones, and facial expressions, it seems impossible to avoid forming such an impression. Although not terribly reliable, such impressions are likely to correlate roughly with measured levels of depressive symptomatology. Having formed such an impression, a researcher who then administers the AMT face-to-face, and who expects the overgenerality of responses to correlate with depression, may inadvertently elicit responses that confirm that expectation (Dew, 1993; Hazelrigg, Cooper, & Strathman, 1991). According to this line of supposition, the reported correlations between depression and AMT scores may be inflated by this experimenter/expectancy effect when the AMT is administered face-to-face.

In the present study, by computerizing the two versions of the AMT and leaving the testing room while the tests were being administered, the principal investigator minimized such experimenter/expectancy effects. This may have contributed to the null results in the present study.

Even if, however, the significant results reported in many of the correlational studies may have been inflated by such experimenter/expectancy effects, there have been other studies in which the AMT was computerized (Rekart et al., 2006) or in which other steps were taken were minimize experimenter effects (e.g., Debeer et al., 2009; Raes et

al., 2007), and depression was nevertheless found to correlate with AMT scores. The significant results reported in those cases do not appear to have been inflated with such an experimenter/expectancy effect. Nor can the longitudinal studies in which AMT scores were found to predict the course of psychopathology be easily imputed to any such experimenter/expectancy effect.

The prior administration of the miCAMT may minimize executive capacity demands

As discussed above, the justification for using two different versions of the AMT in this study was to attempt to dissociate instruction neglect from autobiographical overgenerality: It was predicted that the miCAMT would measure only autobiographical overgenerality, while the siCAMT would confound autobiographical overgenerality and instruction neglect. The justification for always administering the miCAMT prior to the siCAMT was to prevent the specificity instructions included in the siCAMT from influencing participants' responses to the miCAMT, i.e., from altering participants' characteristic patterns of spontaneous overgenerality. It appears possible, however, that the research design resulting from these justifications may have inadvertently prevented the siCAMT from detecting instruction neglect. This may be part of the reason that the predicted correlation between depression and siCAMT scores was not detected.

Dalgleish et al. (2007) reported that when the parameters of the AMT are manipulated to minimize the demands on executive control, there is no correlation between depression and AMT scores. Specifically, Dalgleish et al. varied the time-duration of the test's cue words: Half of the cue words related to time periods longer than a single day (e.g., *summer, cancer, adolescence*); it was predicted that these long-

duration cue words would tend to evoke memories that violated the test's specificity instructions. In order to comply with the specificity instruction, participants would have to utilize their executive capacity to inhibit such overgeneral memories, and continue searching for a single-day memory. The other half of the cue words related to events that typically occur within a single day (e.g., *kiss*, *accident*, *evening*); it was predicted that these short-duration dues words would tend to evoke single-day memories, thereby facilitating participants' compliance with the test's specificity instruction and minimizing demands on executive control. Dalgleish et al. reported a negative correlation between depression and the specificity of memories retrieved in response to long-duration cue words ($r(16) = -0.50$), but no correlation between depression and the overgenerality of memories retrieved in response to the short-duration cue words ($r(16) = -0.06$). In other words, minimizing the demand that the AMT places on executive control tends to eliminate the association between depression and AMT scores.

The design of the present study may have inadvertently minimized the demands on executive control involved in responding to the siCAMT. When the standard-instruction version of the AMT is administered in isolation, participants are required to utilize their executive capacity to retain and comply with three instructions: (1) recall an autobiographical memory, (2) that is associated with the cue word, (3) and that is of a single-day event. Each participant's AMT score represents the extent to which he or she succeeded in retaining and complying with the first and third of these instructions. However, in the present study the siCAMT was administered following the miCAMT, which required participants to retain and comply with the first two instructions: (1) recall and autobiographical memory, (2) that is associated with the cue word. It now seems

possible that this prior administration of the miCAMT functioned as a practice session – allowing participants to practice the first two instructions until they were essentially automatic. When the siCAMT was then administered to the participants, they were required to retain and comply with only a single additional instruction – that the retrieved memory be of a specific event. This inadvertent minimization of demands on executive control may have reduced the capacity of the siCAMT to detect instruction neglect, and therefore to detect any association between depression and siCAMT scores.

Null result regarding hypothesis 2

Contrary to the second research hypothesis, miCAMT scores did not correlate with depression scores.[10] The Cronbach's alpha for the miCAMT was only 0.58. As discussed above in conjunction with the siCAMT, it is possible that the imprecision of the miCAMT prevented the detection of the hypothesized correlations. However, because only one published AMT study has been found in which the Cronbach's alpha for the AMT was reported, and in that study (Hauer et al. 2008) the Cronbach's alpha was 0.64 but AMT scores were nevertheless found to correlate with BDI-II scores, it is difficult to assess the likelihood of this explanation.

A more probable explanation for this null result may be the inadequate power of the present study to detect a relatively small effect size. As discussed above, Raes et al. (2007) administered a sentence-completion, minimal-instruction version of the AMT (sc/miAMT) and the BDI-II to a sample of 197 university students, and reported a correlation between depression and sc/miAMT scores of $r = 0.18$ (Williams et al., 2007).

[10] Among the 15 participants recruited from the University Counseling Center, and utilizing uncorrected α's, miCAMT scores were found to correlate with BDI-II. For the reasons discussed in footnote 9 above, this correlation is best left uninterpreted.

Similar results are reported by Debeer et al. (2009), who administered a written-response, minimal-instruction version of the AMT (wr/miAMT) and the BDI-II to a sample of 314 university students and reported a correlation between depression and wr/miAMT scores of r = -0.20 (Debeer et al. 2009).

With a sample of 75 participants, the present study had a power of approximately 0.48 to detect a correlation of r = 0.18, and a power of approximately 0.54 to detect a correlation of r = -0.20 (α = 0.05, single-tailed) (Cohen 1969, at 84, arithmetic interpolations from Table 3.3.2). Thus, even if the results reported by Raes et al. (2007) and Debeer et al. (2009) are assumed not to reflect any type 1 error (i.e., even if it is assumed that depression and the tendency to give overgeneral responses to a minimal-instruction version of the AMT correlate at the rate of r = 0.18 or 0.20), there was a probability of approximately 0.50 that the present study would fail to detect that effect. No inferences can be drawn from a null result in such an under-powered test.

Null result regarding hypothesis 3

Contrary to the third research hypothesis, siCAMT scores correlated neither with depressive rumination nor with executive dysfunction. The two components of this null result will be discussed separately.

siCAMT and depressive rumination

Power

Ramponi et al. (2004) reported that in a sample of nonclinical research participants depressive rumination correlated at r = -0.49 with the specificity of responses to the AMT (Ramponi et al., 2004). Similarly, Raes et al. (2005) reported that in a

sample of clinically depressed research participants depressive rumination as measured by the RSS correlated at r = -0.51with the specificity of AMT responses (Raes et al. 2005) And Raes et al. (2006) reported that in a sample of clinically depressed research participants depressive rumination as measured by the RRS correlated at r = -0.40 with the specificity of AMT responses.

Based on these studies, the correlation between depressive rumination and scores on the siCAMT was predicted to be in the range of 0.49 to 0.51. With a sample of 75 research participants, the present study should have had a power in excess of 0.98 to detect a correlation in this range (Cohen 1969, at 84, Table 3.3.2). It is therefore not probable that the null result can be imputed to inadequate power.

Correlation between depressive rumination and depression

A more plausible explanation for the failure to find a correlation between depressive rumination and siCAMT scores relates to the strong correlation between depressive rumination and depression. Depressive rumination was found to be highly correlated with depression in this study (r = 0.73; p< 0.01). This is consistent with the report of Ramponi et al. (2004) that depressive rumination (as measured by an instrument similar to the RRS) correlated with BDI scores at r = 0.57. Ramponi et al. reported that the overgenerality of AMT responses correlated with both BDI scores and depressive rumination, but that when BDI scores were entered in the second step of a hierarchical regression analysis, depressive rumination provided no additional contribution to the overgenerality of AMT responses in step three (Ramponi et al., 2004). Given this close association between depression and depressive rumination, is it plausible that depressive rumination failed to correlate with siCAMT scores for the same reasons that depression

failed to correlate with those scores – the elimination of experimenter/expectancy effects and the prior administration of the miCAMT inadvertently minimizing the demands that the siCAMT places on executive function.

siCAMT and executive dysfunction

The siCAMT required participants to comply with an instruction to retrieve and report only specific autobiographical memories, and was conceptualized as placing demands upon executive function. For this reason, the overgenerality of responses to the siCAMT was hypothesized to correlate positively with measures of impairment of executive function.

This hypothesis was consistent with other research: Dalgleish et al. (2007) reported partial correlations between the specificity of AMT responses the impairment of executive control ranging from $pr = -0.39$ to $pr = 0.60$.[11] The hypothesized association between executive dysfunction and overgenerality of siCAMT responses was also consistent with the principal investigator's thesis research, which found a correlation of $r = -0.37$ between scores on the Visual Search Task and the specificity of AMT responses (McCowin, 2007).

With a sample of 75 participants, this study had a power of approximately 0.94 to detect a correlation of 0.37 ($\alpha = 0.05$, single-tailed; Cohen 1969, at 84, arithmetic interpolation from Table 3.3.2). It is therefore unlikely that the present study's null result reflects type 2 error. Rather, as discussed above in connection with the failure to find a

[11] The first of these correlations is negative because of the valence of the measure of executive impairment – a larger score reflected greater impairment. This measure correlated negatively with autobiographical specificity – greater executive impairment correlated with less specific responses to the AMT. The second correlation is positive because the valence of the measure of executive impairment is reversed – a larger

correlation between depression and scores on the siCAMT, it is possible that administering the miCAMT prior to the siCAMT minimized the demands that the latter test placed upon executive functioning, and thereby prevented the detection of any correlation between impairment of executive function and the scores on that test.[12]

Null result regarding hypothesis 4

Contrary to the fourth research hypothesis, no correlation was detected between depressive rumination and miCAMT scores. Raes et al. (2007) reported that in a sample of 197 nonclinically depressed research participants, depressive rumination (as measured by the four-item Visual Analogue Rumination Scales) correlated at $r = 0.15$ with the overgenerality of responses to a minimal-instruction version of the AMT. Similarly, Debeer et al. (2009) reported that in a sample of 161 nonclinically depressed research participants, depressive rumination as measured by the RRS correlated at $r = -0.28$ with the specificity of responses to a minimal-instruction version of the AMT.

Based upon these studies, the correlation between depressive rumination and scores on the miCAMT was predicted to be in the range of 0.15 to 0.28. With a sample of 75 research participants, the present study should have had a power of 0.38 to detect a correlation of 0.15, and a power of 0.79 to detect a correlation of 0.28. The failure to

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score reflected more intact executive control, and more intact executive control correlated with more specific responses to the AMT.

[12] It was suggested above that another possible reason for the failure to find a correlation between depression and scores on the siCAMT may have been the elimination of experimenter expectancy effects – that in the traditional face-to-face mode of administering the standard-instruction test, experimenters unwittingly elicit less specific autobiographical memories from participants whom they perceive to be depressed. If not for the results of the principal investigator's thesis research, that explanation might apply equally to the failure to find a correlation between executive dyscontrol and scores on the siCAMT. As noted previously, in that thesis research a significant correlation between one measure of executive dyscontrol and scores on test essentially equivalent to the siCAMT was detected. That result suggests that the correlation between executive dyscontrol and the over-generality of responses to the siCAMT is not merely an artifact of an experimenter expectancy effect.

detect the predicted correlation between depressive rumination and scores on the miCAMT may simply reflect the relatively small power of this study; no inferences can be drawn from a null result in such an under-powered study.

Limitations of the present study and directions for future research

As discussed in the preceding section, the null results in the present study may have resulted from three aspects of this study: (1) inadequate power, (2) removal of the experimenter or expectancy effect, and (3) the siCAMT's demand on executive functioning having been minimized by the prior administration of the miCAMT. Each of these three aspects of the present study suggests future research.

Power

As discussed above, an immediately plausible explanation for the failure to detect correlation between scores on the miCAMT and either depression or depressive rumination is that the sample of 75 research participants in the current study did not provide sufficient power to detect the relatively modest correlations that were expected based on previously published studies. Although it is conceptually simple to remedy the inadequate power of the present study design – simply increase the sample size – that remedy may not be logistically practical.

With respect to the predicted correlation between depression and scores on the miCAMT, it would be challenging to design a study with sufficient power that a null result would be interpretable. Raes et al. (2007) reported a correlation of $r = 0.18$ between depression and scores on their minimal-instruction version of the AMT; Debeer et al. (2009) reported a correlation of $r = -0.20$ between depression and scores on their

minimal-instruction AMT. A sample size of 250 research participants would be required for a power of 0.94 to detect the larger of these two effect sizes, and a sample size of 450 research participants would be required for a power of approximately 0.95 to detect the smaller of these two effect sizes (Cohen, 1969, at 84, Table 3.3.2). Given the amount of effort involved in collecting and scoring AMT responses, such sample sizes challenge the limits of practicality.

With respect to the predicted correlation between depressive rumination and scores on the miCAMT, an adequately powered study would likely be impractical. Raes et al. (2007) reported a correlation of $r = 0.15$ between depressive rumination and scores on their minimal-instruction AMT; Debeer et al (2009) reported a correlation of $r = -0.28$ between depressive rumination and scores on their minimal-instruction AMT. A sample size of 180 research participants would be required for power of approximately 0.96 to detect the larger of these effect sizes, and a sample size of 900 would be required for power of approximately 0.96 to detect the smaller effect size (Cohen, 1969, at 84, Table 3.3.2). It does not presently seem possible to justify the amount of time and expense that would be demanded by such a study.[13]

Experimenter/expectancy effect

As discussed above, the failure to detect a correlation between the scores on the siCAMT and either depression or depressive rumination may have been an unintended consequence of eliminating experimenter/expectancy effects. Although a limited number

[13]Raes et al. (2007) detected a correlation of $r = 0.15$ in a sample size of 197. A retrospective power analysis suggests that they had power of approximately 0.65 to detect this effect. The authors appear to have benefitted from good fortune.

of studies have computerized the AMT or administered it to groups of participants, the majority of reported studies administer the test in a one-on-one, face-to-face format. It is possible that the experimenters in these studies unwittingly confirm their a priori expectations by eliciting overgeneral autobiographical memories from participants who appear to be depressed and specific autobiographical memories from participants who appear to be euthymic. The possibility that the widely reported autobiographical overgenerality effect is to some extent a result of such experimenter/expectancy effects remains to be tested.

One way to test for the presence of such an experimenter/expectancy effect would be to select a reported study that has found a correlation between depression and AMT scores, and then to replicate that study as closely as possible, altering only one parameter – the face-to-face presentation, administering the AMT instead by computer. If such a study were adequately powered, a failure to find the predicted correlation between depression and AMT scores would support an inference that the face-to-face administration is producing the autobiographical overgenerality effect. However, this proposed study design might be vulnerable to a criticism that some other parameter had been unwittingly altered, and that it was this alteration and not the elimination of face-to-face administration that would account for the null result.

An alternative test for the presence of an experimenter/expectancy effect would be to create a single, between-subjects study utilizing two versions of the AMT that were identical in all respects except the mode of administration – one version being computerized, and the other being face-to-face. A difficulty with such a study would be controlling the experimenter's expectancy. If, for example, the principal investigator in

the present study were to administer a face-to-face version of the AMT, he might expect there to be an expectancy effect, and therefore overcompensate so as to alter the nature of the expectancy effect. This proposed study design would have to use test administrators who had been indoctrinated regarding the expected association between depression and AMT scores, but who had not been informed regarding the experimenter/expectancy effect.

Prior administration of miCAMT reducing siCAMT's demands on executive control

As discussed above, the failure to detect a correlation between the scores on the siCAMT and depression, impairment of executive functioning, and depressive rumination may also have been an unintended consequence of administering the miCAMT prior to the siCAMT, thereby reducing the demands on executive control involved in complying with the siCAMT's specificity instruction. This hypothesis could be tested by repeating the present study with one alteration – eliminating the miCAMT. If the predicted correlations then emerged between scores on the siCAMT and depression, impairment of executive functioning, and/or depressive rumination, this would support an inference that the prior administration of the miCAMT had caused the null results in the present study.

Clinical implications

As discussed above, the tendency to retrieve nonspecific memories in response to standard versions of the AMT has been found to precede the onset and predict the course of depression. These findings suggest that the AMT might be measuring a process that poses a vulnerability to depression. If such a process could be correctly identified, it might be a target for therapeutic intervention.

For example, if is assumed that the tendency to retrieve nonspecific memories in response to the AMT is a reflection of autobiographical overgenerality, then it might be concluded that this is the process that predisposes people to depression, i.e., that an overgeneral bias in one's autobiographical remembering renders one vulnerable to the onset and persistence of depression. And if so, interventions to increase the specificity of memory encoding and/or retrieval might be recommended. However, if it is assumed that instruction neglect is the process that drives the tendency to response to the AMT with nonspecific memories, then it might be concluded that impairment of motivation and/or executive control create a vulnerability to depression. And if so, interventions designed to enhance motivation and/or executive control might be recommended.

Until it can be determined what process or processes are actually measured by the AMT, the possibility of making clinical use of this body of research is limited.

APPENDIX A

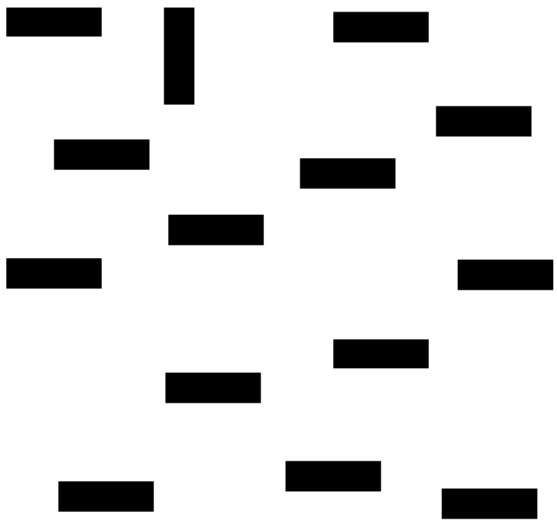
VISIUAL SEARCH TASK

Subtest 5

If you are ready to proceed, click in the "Proceed" button below.

Proceed

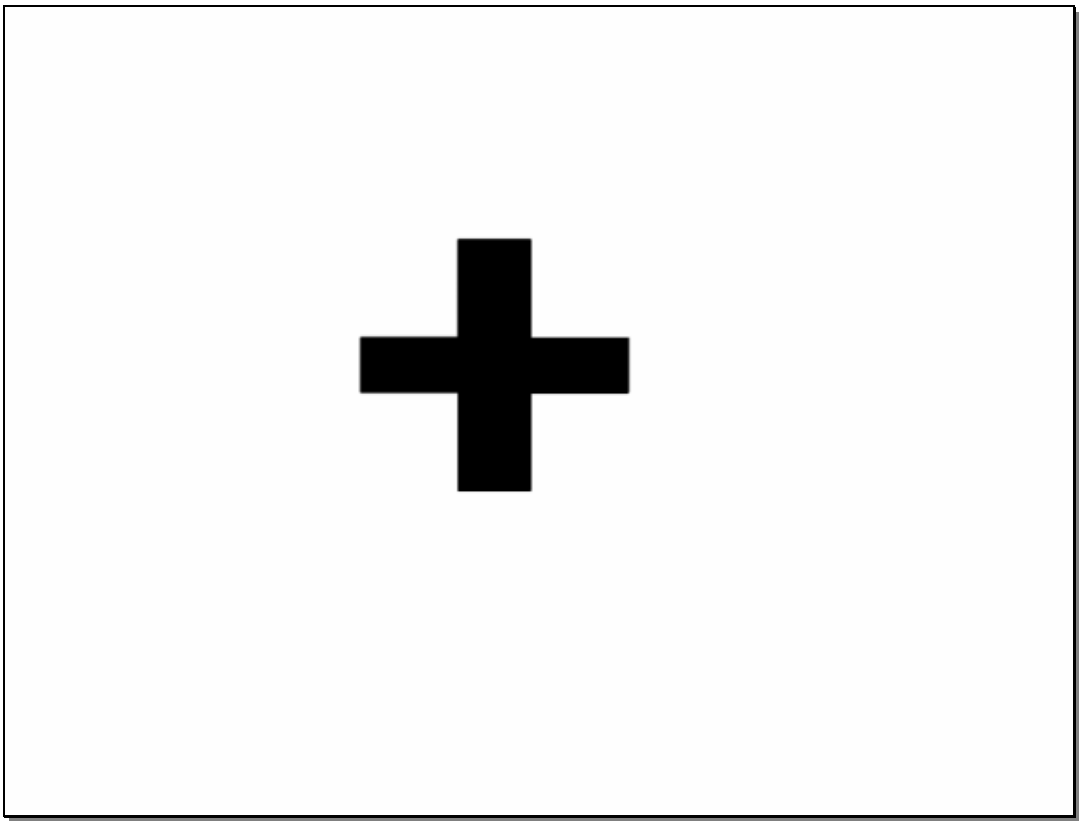
This subtest will measure the accuracy and speed of your responses. You will see a series of screens like the one below. Some screens contain a vertical black rectangle; others do not. Note that the example below contains a vertical black rectangle.

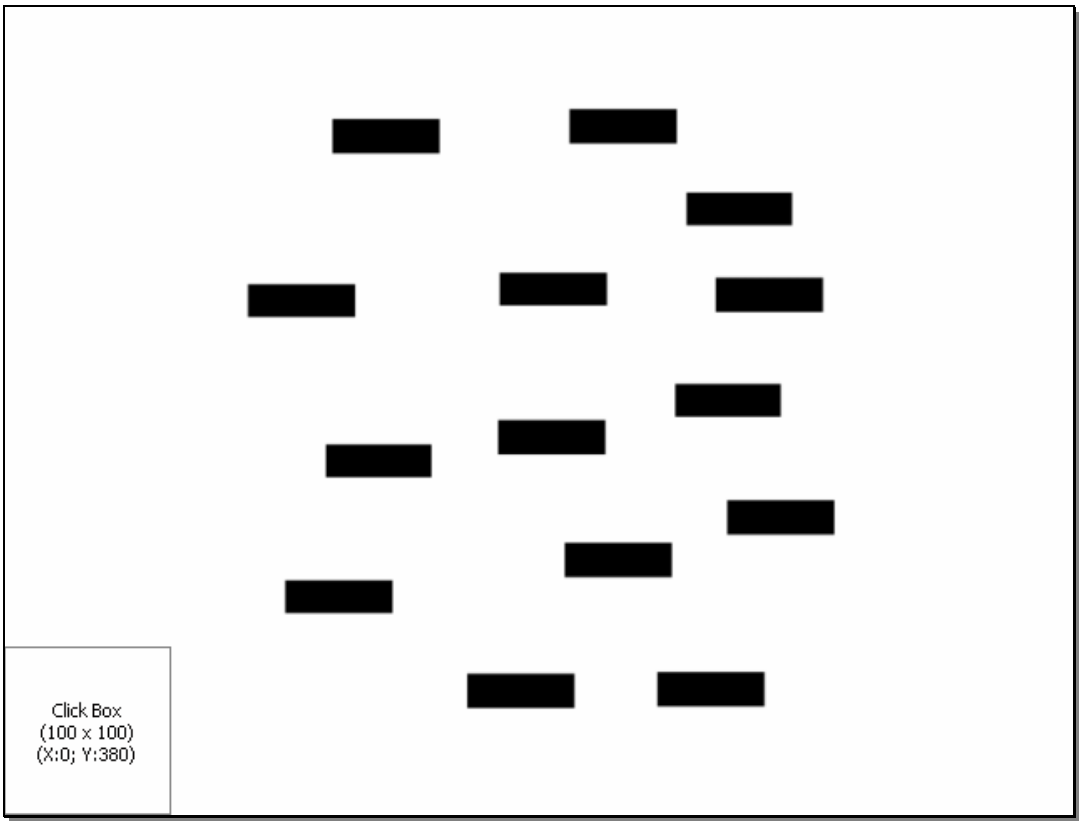


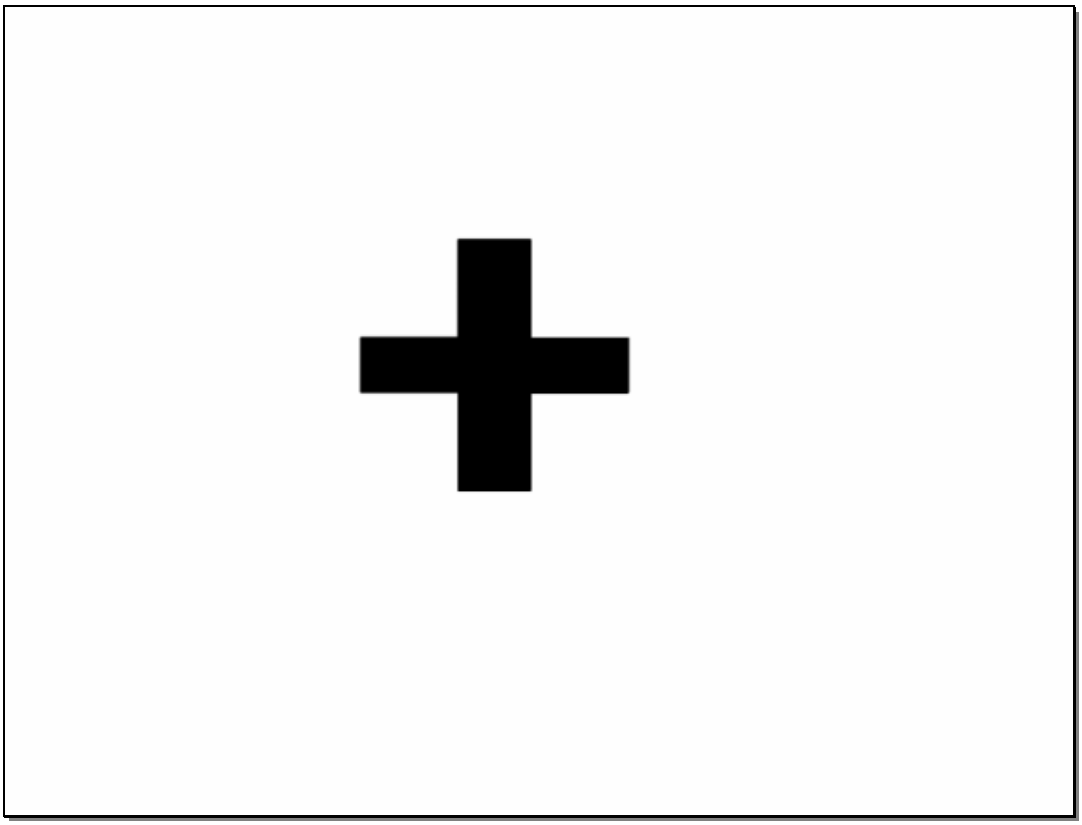
If there is no vertical black rectangle, press the “A” key with your left hand. I the screen does contain a vertical black rectangle, press the “L” key with your right hand.

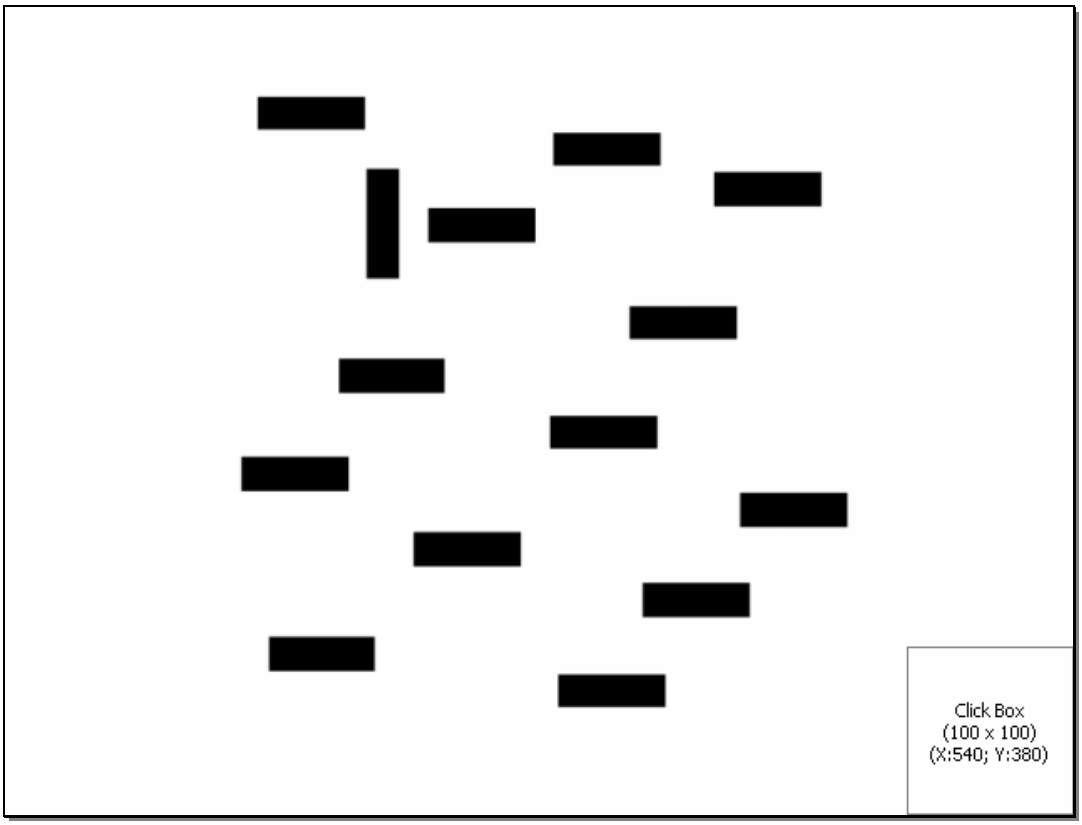
Try a few practice items. Pre-position your left hand over the "A" key, and your right hand over the "L" key. Respond as quickly and accurately as possible. Just before each screen appears, you will see a cross in the middle of the screen that will last or one and one half seconds.

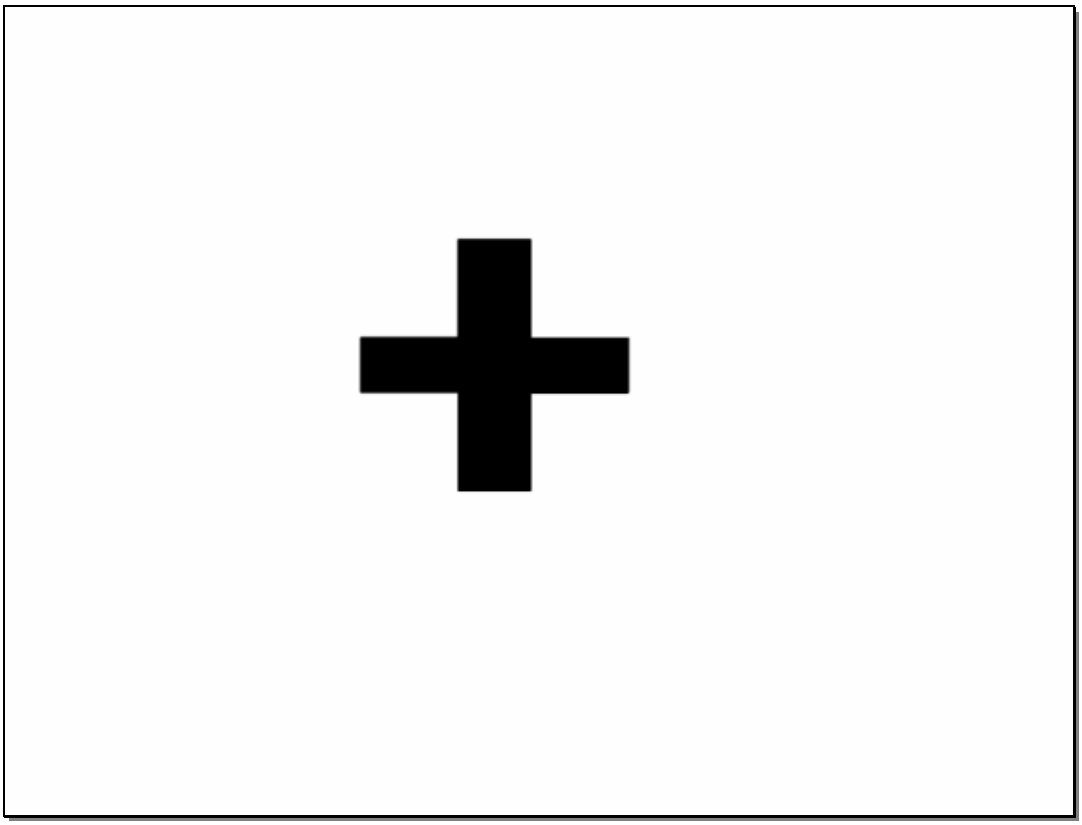
Remember, press "L" if you see the vertical black rectangle; press "A" if you do not.

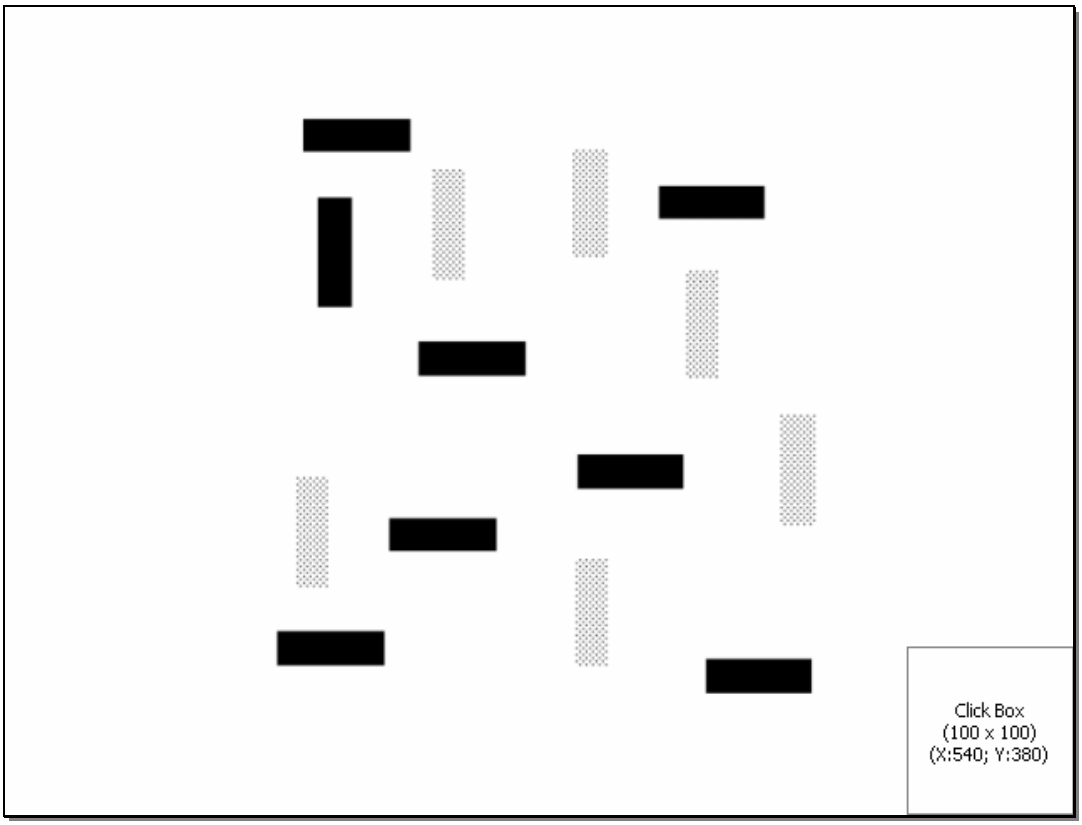


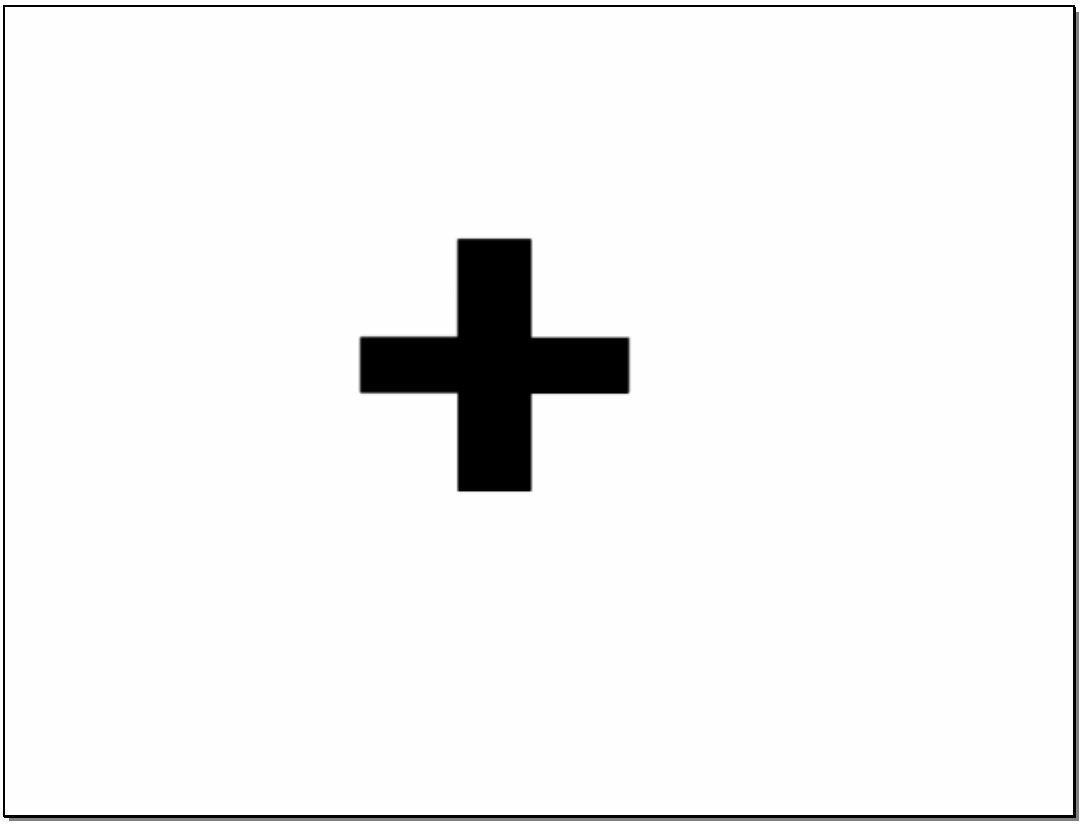

Click Box
(100 x 100)
(X:0; Y:380)

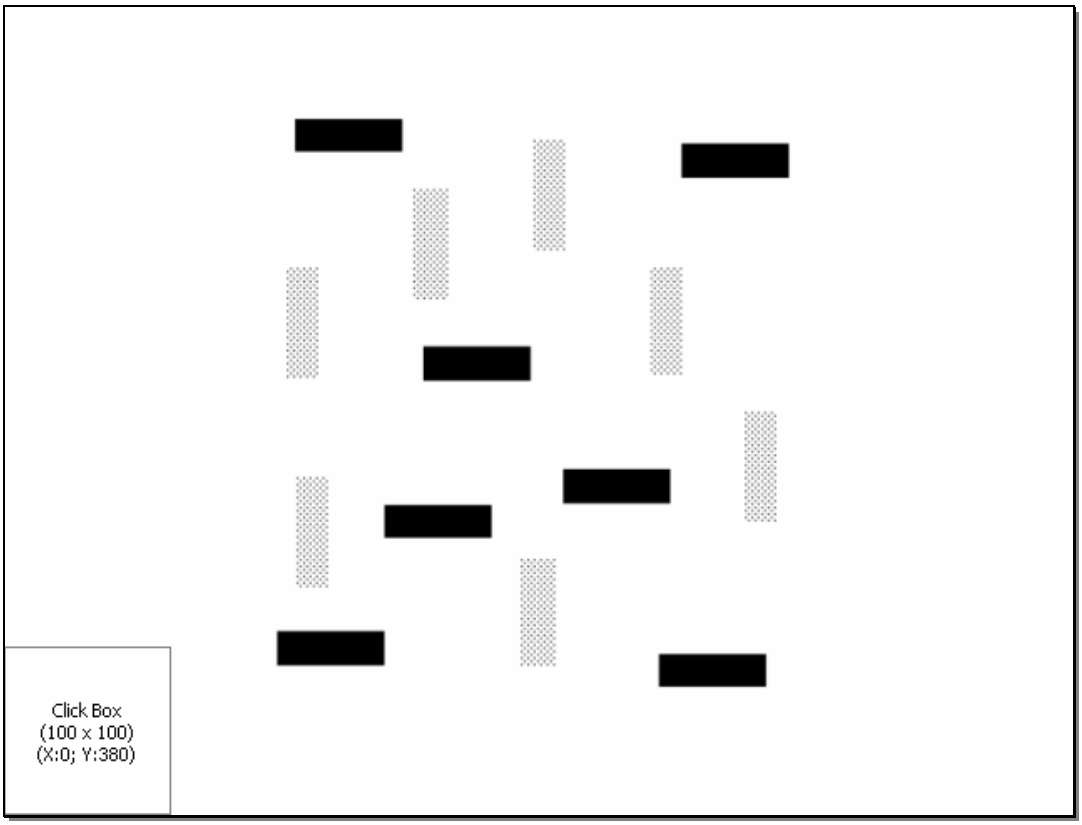



Click Box
(100 x 100)
(X:540; Y:380)




Click Box
(100 x 100)
(X:540; Y:380)




Click Box
(100 x 100)
(X:0; Y:380)

Now you understand the procedure. There will be a block of 20 screens, then a 30-second break, and then another block of 20 screens.

Remember, press the “L” if you see the vertical black rectangle; press the “A” if you do not.

When you are ready, click in the “Proceed” button below, and the first block of screens will begin immediately.

Proceed

APPENDIX B

RUMINATION RESPONSE SCALE

Rumination Response Scale

People think and do many different things when they feel depressed. Please read each of the items below and indicate whether you almost never, sometimes, often, or almost always think or do each one when you feel down, sad, or depressed. Please indicate what you *generally do, not* what you think you should do.

	How often do you:	1 Never or Almost Never	2 Sometimes	3 Often	4 Always or Almost Always
1.	think about how alone you feel				
2.	think “I won’t be able to do my job if I don’t snap out of this”				
3.	think about your feelings of fatigue and achiness				
4.	think about how hard it is to concentrate				
5.	think “What am I doing to deserve this?”				
6.	think about how passive and unmotivated you feel.				
7.	analyze recent events to try to understand why you are depressed				
8.	think about how you don’t seem to feel anything anymore				
9.	think “Why can’t I get going?”				
10.	think “Why do I always react this way?”				
11.	go away by yourself and think about why you feel this way				
12.	write down what you are thinking about and analyze it				
13.	think about a recent situation, wishing it had gone better				
14.	think “I won’t be able to concentrate if I keep feeling this way.”				
15.	think “Why do I have problems other people don’t have?”				
16.	think “Why can’t I handle things better?”				
17.	think about how sad you feel.				
18.	think about all your shortcomings, failings, faults, mistakes				
19.	think about how you don’t feel up to doing anything				
20.	analyze your personality to try to understand why you are depressed				
21.	go someplace alone to think about your feelings				
22.	think about how angry you are with yourself				

APPENDIX C

RUMINATION ON SADNESS SCALE

Rumination on Sadness Scale

When I am sad, down, or feel blue….

		Not at all	A little	Sometimes	Frequently	Very Much
1.	I have difficulty getting myself to stop thinking about how sad I am.					
2.	I repeatedly analyze and keep thinking about the reasons for my sadness.					
3.	I search my mind many times to try and figure out if there is anything about my personality that may have led me to feel this way.					
4.	I get absorbed in thinking about why I am sad and find it difficult to think about other things.					
5.	I search my mind repeatedly for events or experiences in my childhood that may help me understand my sad feelings.					
6.	I keep wondering about how I was able to be happy at other points in my life.					
7.	I lie in bed and keep thinking about my lack of motivation and wonder about whether it will ever return.					
8.	If people try to talk to me or ask me a question it feels as though they are interrupting an ongoing silent conversation I am having with myself about my sadness.					
9.	I question and keep wondering about the meaning of life to find clues that may help me understand my sadness.					
10.	I repeatedly think about what sadness really is by concentrating on my feelings and trying to understand them.					
11.	I get the feeling that if I think long enough about my sadness I will find that it has some deeper meaning and that I will be able to understand myself better because of it.					
12.	I keep thinking about my problems to try and examine where things went wrong.					
13.	I exhaust myself by thinking so much about myself and the reasons for my sadness.					

APPENDIX D

INFORMED CONSENT DOCUMENT

Consent Document for Humanities or Social/Behavioral Science Research

Background:

If you meet the following criteria, you are being invited to take part in a research study being conducted as a doctoral dissertation project by Steven McCowin, a graduate student in Counseling Psychology:

- English is your primary language;
- You have normal vision, hearing and reading ability;
- You are at least 18, and not older than 50;
- You have no current substance dependence; and
- You have no history of psychosis, PTSD, or organic brain difficulty.

The research study regards the relationship between memories and emotion. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you volunteer to take part in this study.

You should be aware that, in order to complete this study, Mr. McCowin cannot inform you of all of its details at the outset and that certain details have been left out of the description of the study. However, Mr. McCowin will explain these details to you at the end of your participation. In addition, you are free to choose not to participate if you are uncomfortable with this omission or for any other reason, and your refusal will not be held against you in any way.

Study Procedure/Intervention/Methods:

If you choose to participate in this research study, you will be asked to complete a number of questionnaires and tests that have been grouped into the following four sections (all of these questionnaires and tests will be administered to you in a single session in Room 308F of Milton Bennion Hall):

The first section will be administered via a computer. You will be asked to recall memories. This first section will take you approximately 10 minutes to complete. After this first section, you will have a five-minute break.

The second section will also be administered via a computer. You will again be asked to recall memories. This section will take approximately 15 minutes to complete

The third section will be administered by Mr. McCowin. You will be asked to report on your emotional state. This section should take approximately 20 minutes to complete. After this third section you will have a two-minute break.

The fourth section is a combination of five measures of your processing speed, memory, and the ways in which you typically respond to feeling blue. Some of these measures will be administered via a computer; others will be administered by Mr. McCowin. This section should take approximately 45 minutes to complete, which will include a two-minute break.

It will take you approximately one hour and 40 minutes to complete all of the questionnaires and tests. When you are finished, Mr. McCowin will give you a full explanation about the purposes of this study and answer any questions you may have about the study.

Risks:

The risks of this study are minimal. You may feel upset thinking about or talking about personal memories, or you may feel that your privacy might be compromised if you choose to disclose embarrassing memories. These risks are similar to those you experience when discussing personal information with others. You should know that Mr. McCowin will hold the content of all of your responses strictly confidential. You may also feel frustrated by some of the tests which are purposefully designed to be difficult. If you feel upset from this experience, you can tell Mr. McCowin and he will tell you about resources available to help.

If you are participating in this study to fulfill the research participation requirement for a class in Psychology or Educational Psychology, you should know that your performance on the questionnaires and tests is not graded and will not affect your grades in any of those courses.

Benefits:

We cannot promise any direct benefit for taking part in this study. However, possible benefits include helping you develop a greater understanding of the relationship between your memories and emotions.

Alternative Procedures/Intervention/Methods:

You do not have to take part in this study if you do not wish to do so.

If you are participating in this study to fulfill the research participation requirement for a class in Psychology or Educational Psychology, one of the requirements for those courses is that you participate in research activities for a certain number of hours. You will receive two hours of credit for participating in the present study.

If you were going to participate in this study to fulfill the research participation requirement for a Psychology or Educational Psychology class, but decide that you do not want to take part in the study, you may earn research participation credit by selecting from other studies, or by completing other alternatives (typically reading a few chapters and taking a test on each chapter). If you are interested in possible alternatives for fulfilling the research participation requirement, information on those alternatives will be provided to you.

Confidentiality:

Your identity will remain confidential. Only Mr. McCowin and members of his research team will have access to your responses to the questionnaires and tests. Your name will not be associated with any of your written or oral responses; instead, these will be associated only with a confidential number that

will be assigned to you. Only Mr. McCowin will have access to a list associating your name with your number. All of your written responses will be stored in a locked filing cabinet in Mr. McCowin's work space. All of your oral responses will be recorded as digital files, and will be stored on Mr. McCowin's password protected computer. Your data will be kept confidential. However, there are some cases in which a researcher is legally obligated to make a report to law enforcement agencies regarding certain issues, such as serious threats of harm to yourself or to public health or safety.

If you are currently a client of the University Counseling Center (UCC) or of the University of Utah Neuropsychiatric Institute (UUNI), you will be given a copy of this consent document and asked to sign it and provide a telephone number at which Mr. McCowin can contact you to schedule a testing time. The UCC or UUNI will forward the completed consent document with your name and telephone number to Mr. McCowin. Only Mr. McCowin, members of his research team, and personnel of either the UCC or UUNI will have any access to the completed consent document with your name and telephone number. If in Mr. McCowin's clinical judgment there are issues of sufficient severity that it would be warranted to alert your counselor at the UCC or UUNI, Mr. McCowin will do so; such issues might include threats of harm to yourself or others, or emotional distress that is severe enough to raise a significant risk that you might harm yourself or others.

If you are participating in this study to fulfill the research participation requirement for a class in Psychology or Educational Psychology, your decision to participate or not in this research will not be kept confidential from your instructors.

Person to Contact:

If you have questions, complaints or concerns about this study, you can contact Steven McCowin at 581-7148. If you feel you have been harmed as a result of participation, please call Steven McCowin at 581-7148. A message can be left for Steven McCowin at this number during business hours.

Institutional Review Board:

Contact the Institutional Review Board (IRB) if you have questions regarding your rights as a research participant. Also, contact the IRB if you have questions, complaints or concerns which you do not feel you can discuss with the investigator. The University of Utah IRB may be reached by phone at (801) 581-3655 or by e-mail at irb@hsc.utah.edu.

Voluntary Participation:

It is up to you to decide whether or not to take part in this study. If you decide to take part you will be asked to sign a consent form. You are still free to withdraw at any time. This will not affect your relationship with the investigator.

Refusal to participate or the decision to withdraw from this research will involve no penalty or loss of benefits to which you are otherwise entitled.

Costs and Compensation for Participants:

You will not incur any costs as a result of participating in this research study – just your time. If you were recruited from the Educational Psychology or Psychology subject pool, you will receive course credit as compensation for your participation. If you were recruited from the University Counseling Center or the University of Utah Neuropsychiatric Institute, you will be given two movie tickets as compensation for your participation.

Consent:

By signing this consent form, I confirm I have read the information in this consent form and have had the opportunity to ask questions. I will be given a signed copy of this consent form. I voluntarily agree to take part in this study.

_____
Printed Name of Participant

_____
_____
Signature of Participant Date

__(___)___-__ _____
Telephone number at which Participant may be contacted

_____
Printed Name of Researcher or Staff

_____
_____
Signature of Researcher or Staff Date

APPENDIX E

DEPRESSION SCREENING QUESTIONS

During the last 2 weeks, how frequently have you been troubled by the following?	Not at all	A few days	More than half the days	Almost every day
1. Not finding much interest or pleasure in doing the things you usually enjoy.				
2. Feeling sad, down, hopeless, or depressed.				
3. Difficulty falling or staying asleep, or just the opposite: sleeping too much.				
4. Not having enough energy or feeling tired much of the time.				
5. Lacking your normal appetite, or just the opposite: eating too much.				
6. Not liking yourself very much or feeling that you have let yourself or others down				
7. Difficulty concentrating or staying focused on what you're trying to do or read.				
8. Feeling so restless or wound up that you have to keep moving or doing something, or just the opposite: speaking or moving so slowly that others might notice.				
9. Thinking that you might be better off dead, or thinking of somehow hurting yourself.				
10. Less than your usual interest in sex.				

APPENDIX F

PROTOCOL ORDER CHECKLISTS

Protocol Order #1

Participant # ___

Consent Document
- Executed __
- Confidentiality __

niAMT Form __ __

5-minute break
- Demographics
  - Age ___
  - Gender ___

- Criteria: English as 1st language __
  - Normal vision, hearing, reading ability __
  - 18 – 50 years old __
  - No current substance dependence __
  - No Hx of psychosis, PTSD, organic brain injury __

AMT __
BDI-II __
HRSD __

2-minute break

Stroop __
RRS __
VST __

2-minute break

RSS __
OSPAN __

Protocol Order #2

Participant # ___

Consent Document
- Executed __
- Confidentiality __

niAMT Form ____ __

5-minute break
- Demographics
  - Age ___
  - Gender ___

- Criteria: English as 1st language __
  - Normal vision, hearing, reading ability __
  - 18 – 50 years old __
  - No current substance dependence __
  - No Hx of psychosis, PTSD, organic brain injury __

AMT __
BDI-II __
HRSD __

2-minute break

OSPAN __
RSS __
VST __

2-minute break

RRS __
Stroop __

APPENDIX G

DEBRIEFING OUTLINE

Debriefing Outline

1. As stated in the Informed Consent document, the purpose of this study was to explore the relationship between mood and emotion.

2. The detail left out of the Informed Consent document is that we're interested in the specificity of autobiographical memories – that is, whether you tend to remember your past life in general terms (e.g., "those years in college") or in specific terms (e.g., "the day I took that autobiographical memory test").

3. Prior study has shown that people who are depressed tend to remember in general rather than specific terms.

4. This study has the following specific goals:

    a. To see whether a computerized version of the Autobiographical Memory Test that omitted any specificity instruction would yield the same results;

    b. To try and repeat the previously shown correlation between depression and autobiographical over-generality;

    c. To see if autobiographical over-generality would correlate with measures of executive control; and

    d. To see if autobiographical over-generality would correlate with measures of a tendency to engage in depressive rumination.

5. Any questions?

    a. I haven't yet analyzed your memory responses, so I can't tell you about your level of autobiographical generality.
    b. I haven't yet scored your responses to the two measures of depressive symptomology, but may I ask how you are feeling?
    c. [referral to UCC if appropriate]

6. Please don't discuss the details of this study with anyone else who might be participating.

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